

**EUROPEAN INLAND FISHERIES ADVISORY COMMISSION**

**Report of the**

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**AD HOC EIFAC/EC WORKING PARTY ON MARKET PERSPECTIVES  
FOR EUROPEAN FRESHWATER AQUACULTURE**

**Brussels, Belgium, 14-16 May 2001**



Food  
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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS  
Rome, 2001

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This report summarizes the presentations, discussions and recommendations of the Ad Hoc Working Party on Market Perspectives for European Freshwater Aquaculture, Brussels, Belgium, 14-16 May 2001, which was jointly sponsored by the European Inland Fisheries Advisory Commission and the European Commission.

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**ABSTRACT**

The **Ad Hoc EIFAC/EC Working Party on Market Perspectives of European Freshwater Aquaculture** met to address the current situation of the freshwater aquaculture sector in the EIFAC region with particular focus on problems in marketing. The outcome of the workshop aims to provide key information and strategic advice on how to fulfil the production potential of the sector to (i) policy makers, administrators and legislators; (ii) future investors; (iii) consumers, and, particularly, (iv) producers. Trout and carp (about 94 percent) dominate European aquaculture, whereas there are other promising candidates for culture that have not been profitably exploited. The freshwater aquaculture industry in Europe is product or producer driven along traditional lines and suffers particularly from a lack of vertical integration, linking producers to consumers through the marketing chain. The producers will remain at a disadvantage unless they develop better links through association or cooperation. While the preparation and implementation of marketing plans is a responsibility of the industry, and must be financed from this source, additional progress and great benefit could be derived from a comprehensive policy framework. Aquaculture as a food producing system in some cases has been perceived as being in conflict with other parts of the ecosystem. This can best be addressed by the development and dissemination of codes of good aquaculture practice. While the demand for organically produced aquaculture products is growing, certification is still largely based on the standards of private certification bodies.

**Distribution:**

European Commission  
Participants to the Working Group  
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## 1. BACKGROUND

Production of freshwater fish is a major branch of European aquaculture, but the products have a relatively low market value in relation to production costs and producers' profit margins are low. Moreover, market demand for freshwater species, other than trout and carp, is currently rather limited throughout Europe.

The main marketing problems associated with freshwater aquaculture products include low prices, lack of reliable commercial information, a limited product range, based on a small number of species and products (not always adapted to modern market requirements), difficulties in diversification, and lack of promotion. Significant growth of market demand for freshwater fish in the EIFAC region in the near future seems unlikely, unless initiatives are taken to change current trends. Future developments must be considered in an international strategic context.

The *ad hoc* EIFAC/EC Working Party on Market Perspectives for European Freshwater Aquaculture was called to address these issues with particular focus on visions and scenarios for the market and production potential of the freshwater aquaculture sector in the EIFAC region. The outcome of the workshop aims to provide key information and strategic advice to (i) policy makers, administrators and legislators; (ii) future investors; (iii) consumers, and, particularly, (iv) producers. The Agenda of the Workshop and the List of Participants are attached as Appendix 1 and 2, respectively.

## 2. STATUS OF EUROPEAN FRESHWATER AQUACULTURE

Although freshwater aquaculture in Europe faces serious constraints there are also significant opportunities, particularly from the growing gap between supply and demand for fish products, resulting both from the stagnation or decline of marine capture fisheries and increases in demand.

In the decade from 1988-1998 freshwater aquaculture production in Europe dropped from about 600 000 t to 430 000 t. This compares with marine aquaculture which increased from 150 000 t to 660 000 t, excluding molluscs and aquatic plants. A digest of production statistics from the FAO Fishstat database (FAO 2000) is available (under Meeting Documents Twenty-first Session EIFAC/XXI/2000/Inf.4) on the EIFAC website at <http://www.fao.org/fi/body/eifac/eifac.asp>. These gross figures, however, hide significant differences between Western and Eastern Europe. While production in Western Europe increased from 195 500 t to 250 000 t during the period, in Eastern Europe it fell from 411 500 t to 180 000 t, mainly as result of turbulent economic times. There are also major differences in species composition. In the east carps dominated with around 86 percent while salmonids were restricted to 9.4 percent (although trout production did increase during the period). In the west the reverse was true with salmonids just over 85 percent and carps almost 9 percent. The balance in the west represents diversification to small quantities of eel, and smaller quantities of sturgeon and catfish.

It is impossible to avoid the conclusion that, as a result of a variety of factors, freshwater aquaculture has been eclipsed by marine aquaculture both in importance and diversity. The task of identifying these factors is not simple and the core question is whether they can be resolved in order to allow sectoral development.

In the freshwater aquaculture sector production is influenced by two major factors: the climate and the water availability at a specific site (this effectively determines whether cyprinids or salmonids are produced). While water limitations have traditionally governed the maximum production capacity for a location, environmental legislation on waste



loading has largely replaced water availability as the criterion. In the European Community such production limitations have generally restricted corporate growth. This has confirmed the dominance of family-owned and operated units, (micro-enterprises in European Community terms). However, in certain areas there has been a degree of concentration of production leading to cooperative structures for processing and distribution. In other cases mergers and buy-outs have led to establishment of larger companies, able to provide the retail sector with modern consumer products. In the east the transition to a market-led economy has caused the dismantling of some of the large state-run aquaculture enterprises and the emergence of family-run operations similar to those in the European Community.

There are four clear market areas available to the producer of freshwater fish: the food market, restocking, production of ornamental fish and sport fisheries. The food market is the predominant outlet for all freshwater aquaculture whether for immediate local consumption, distribution on a wider scale *e.g.*, through supermarkets or for export. Export opportunities have been limited to some trade between the east and Germany for carp because of production cost differences. Carp is regarded as a traditional product and Germany is the major market. Although in recent times consumption has been increasingly restricted to festive seasons attempts are being made to reverse this trend. Trout on the other hand has been able to develop a more modern consumer-friendly image, enabling the trout sector to keep up with developments in other competing food products. However, salmon from marine aquaculture, supported by very effective promotion, is a serious competitor. The important lessons to be learnt by the trout producers are obvious.

There is a degree of interest in the production of organically certified freshwater fish products but this is hampered by the drop of productivity needed to meet organic standards (a significant aspect in all organic production practices is the issue of transition from the "traditional" practice to organic production), the high cost of certification and the lack of regulation of private certification bodies. If common and transparent standards, based on sound science, are introduced the future could be bright in some selected markets.

The market for stocking fish into rivers, lakes and reservoirs is of interest and should increase with growing environmental pressure to return species that used to be abundant in specific habitats. Salmon, sturgeon and the traditional sports species (including both brown trout and coarse fish) are produced in hatcheries throughout Europe for enhancing native stocks or for restocking. Restocking of species such as sturgeon also has a promising future, both for conservation and commercial purposes.

Ornamental fish production for the aquarium trade is of growing importance, not least to replace the high level of imports.

Sport fisheries offer an attractive diversification opportunity for some freshwater fish farms. Increasing leisure time and the growth of agro-tourism provide a viable market for the development of on-farm freshwater angling facilities. These can easily be integrated with food fish production and can also provide publicity for the food fish through use in restaurants associated with such developments.

### **3. REGULATORY FRAMEWORK**

Throughout Europe aquaculture suffers from the lack of an adequate regulatory framework. It is important that as such a framework is developed it is done so in

consultation with the industry. The industry therefore has the responsibility of cooperation as a coherent partner for discussion.

Within the EC it is recognised that aquaculture producers face a complex regulatory structure and there are moves to make this more transparent. A directory containing the most important regulations, directives and decisions currently in force regarding aquaculture, as well as processing and marketing of fishery products, has been prepared by the EC DG Fisheries services. This will be the nucleus of a database available on the website: [http://europa.eu.int/comm/dgs/fisheries/index\\_en.htm](http://europa.eu.int/comm/dgs/fisheries/index_en.htm). Of the 350 acts currently in the directory approximately half are germane to aquaculture. The key legislative acts are less numerous and are summarised below.

### **3.1 Environmental Legislation**

Environmental protection has assumed a central role in the objectives of the European Community. While current environmental provisions do not create a specific framework for aquaculture, they have relevance for the sector. When setting up a fish farm location and environmental constraints have to be taken into account. Nature conservation requirements are principally found in Directive 79/409/EEC on the conservation of wild birds; as well as Directive 92/43/EEC on the conservation of natural habitats and wild flora and fauna. Since October 2000, most water quality issues have been taken into account through Directive 2000/60/EEC which establishes a framework for Community action in the field of water quality covering inland surface waters, transitional waters, coastal waters and groundwater. In the long term this directive will introduce river basin management, monitoring of the chemical and ecological status of water and pollution measurement. It repeals earlier directives on water quality standards.

Directive 85/337/EEC on the assessment of the effects of public and private projects on the environment requires that projects likely to have a significant effect should be subject to environmental impact assessment (EIA). According to the Directive, the Member States decide whether an intensive fish farm should undergo an EIA. Directive 76/464/EEC on control of pollution by discharge of dangerous substances into the aquatic environment also covers biocides and organic substances used in aquaculture.

Aquaculture activities will be subject to monitoring and possible enforcement action to ensure that they meet emission standards fixed under Directive 76/464/EEC. There may also be restrictions on the use of some chemicals in aquaculture under a set of Directives relating to restriction on the marketing and use of certain dangerous substances.

There are also other controls that may have an effect on aquaculture. Examples are Directive 76/464/EEC controlling discharges of dangerous substances from industry (including heavy metals) and Directive 91/271/EEC on urban wastewater treatment. Both should contribute to achieving better water quality for aquaculture.

### **3.2 Hygiene in Foodstuffs**

EC legislation on food safety is complex and not always clear. Consolidation has progressed under the Simplification of Legislation for the Internal Market (SLIM), with a draft proposal merging 16 Council directives on animal health and food hygiene into four regulations and one directive. These are not yet adopted by the Council but are expected to enter into force in July 2002. The legislation places the full responsibility for food safety on the food producer at all levels of the food chain, from primary production to the consumer. The veterinary rules have also been recast to prevent the spread of animal diseases through products of animal origin. The new directive will repeal previous texts and will apply both to EC products and imports from third countries. Fish farmers will

now be expected to implement hazard analysis and control principles and to keep records relevant to fish health protection.

### 3.3 Fish Disease

There are two directives concerned with the spread of aquaculture disease: Directive 91/67/EEC concerns animal health conditions governing placing on the market of aquaculture animals and products, while Directive 93/53/EEC introduces minimum measures for control of fish diseases. There are also a number of accessory acts.

### 3.4 Markets

Council Regulation (EC) 104/2000 on the common organisation of markets in fishery and aquaculture products allows the setting up of producers' organisations to improve marketing coordination. Market legislation also deals with tariff quotas and duties for imports.

### 3.5 Financial Assistance

The Community provides financial support to aquaculture in two ways. Firstly, through funding research under the Community Research and Technological Development (RTD) Programme, although the bulk of research funding comes from Member States and the industry. Secondly, as capital grant contributions within the framework of structural funds. This is done by the Financial Instrument for Fisheries Guidance (FIG) under regulation (EC) 2792/1999, which in addition to providing funds for productive units, emphasises efforts to improve the environment and collective actions.

## 4. PRODUCTION, PRODUCTS AND SALES

The picture that emerges is of an industry facing severe constraints of stagnation and fragmentation. Partly to blame is the small size of most individual operations and lack of cooperation between producers. Fish farmers, both in fresh and marine waters, are characteristically good at fish production but in general have not always been attuned to changing market requirements. The freshwater aquaculture industry as a whole lacks cohesion, which will be required for a successful future. A combination of low prices and a poor image of the aquaculture industry, aggravated by a strained relationship with environmentalists and lack of political clout, mitigates against increased investment in new processing and product technology. This would be necessary in order to move the product up-market, away from traditional near-pond outlets to the modern, more sophisticated market place.

Trends towards more filleted and smoked products, rather than whole gutted fish, and the availability of trout through supermarket outlets are already apparent. Carp, however, retains a traditional image and suffers from falling sales, implying the need for urgent market action as production volumes could be significantly increased.

Apart from the present concentration on carp, trout and eel there are other candidates for aquaculture, both native and introduced exotic species. The development of fish rearing and processing technologies has opened new possibilities for production of native carnivorous fish such as pike perch and perch. Although they face competition from salmon and marine capture fisheries some 5 000 t/year of each species is expected to enter the EC market. The appearance of new goals in the European fish culture, as fish production for sport fishing, for restocking or for rehabilitation of the original fish fauna, also directed the interest toward other native species. There is controversy surrounding the introduction of exotic species such as tilapia, African catfish or paddlefish, but large quantities of them could be grown in closed culture systems, subject to sufficient

safeguards. However, such controversies may well be overcome by applying relevant existing technical provisions and guideline documents<sup>1</sup>.

Being disorganised the industry is often at the mercy of the processing and marketing sector. It is almost always price-taking rather than price-making. The producers need to devise means of connecting to the consumers with information on farming practices, products and promotion of consumption. There is clearly a need to support consumer-oriented economic research and greater attention to the institutional food service market.

The European industry could draw important lessons from the experience of US catfish farmers. Although little more than 20 years old the US catfish industry already produces 280 000 t/year on land where cotton had become unprofitable. The industry is strongly vertically integrated, from feed supply to the table and relies heavily on an industry association, The Catfish Institute (TCI), for coordination and promotion. The Institute has as its mandate raising awareness of catfish as food through permanent communication (particularly with consumers) and the integration of farmers, processors and the retail sector.

## 5. FOOD QUALITY AND SAFETY, TRACEABILITY AND LABELLING

In recent years the aquaculture industry has been under strain to keep pace with developments and changes in food safety legislation. A worldwide rise in food poisoning outbreaks and the publicity attached to a number of food fraud scandals has increased consumer pressure on governments to ensure consumer protection through improved legislation. All food producing industries now need to comply and to accept the responsibility for the production of safe food, principally through the introduction of control systems based on hazard analysis critical control point theory ("own checks" in the EC). These replace end product inspection. There has inevitably been resistance and misunderstandings but the situation is rapidly improving. In order to enter profitable European markets both domestic production and imports from third countries must be produced under control and be accompanied by production records. It is apparent that the individual small producers have difficulty in understanding and keeping up with legislative changes in such aspects as consumer health and safety as well as environmental protection. This can best be addressed by providing information and training to the industry.

In common with other sectors of the fishing industry, the aquaculture industry in the last few years has had to develop management systems in a pro-active way in order to provide consumer assurance of product safety and, increasingly that production is from sustainable resources. As a result a growing number of aquaculture and fisheries codes of conduct and certification programmes have been developed or are under development. These take many forms from advisory, voluntary to mandatory and are led by government, private sector or joint initiatives. An outline of some of the programmes is presented in Appendix 3.

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<sup>1</sup> Codes of Practice and Manual of Procedures for Consideration of Introductions and Transfers of Marine and Freshwater Organisms  
1988 - FAO European Inland Fisheries Advisory Commission/ International Council for the Exploration of the Sea (ICES) - 1995

There are also numerous private label schemes established by producers and retailers. These vary in nature but usually try to convince consumers via an attached logo or label that the product meets certain standards.

As a consequence of the large number of eco-labelling schemes in operation the EC issued a draft publication entitled 'A Community Approach towards Eco-Labelling of Fisheries Products' in February 2001. This stresses that national authorities should require that all fisheries eco-labelling schemes comply with the following requirements:

- objective and verifiable criteria: the criteria for certification of eco-labelled products shall be precise, objective and verifiable;
- independent assessment and control: eco-labelling schemes shall be independently and continuously controlled and shall ensure accurate identification of the product throughout the chain of custody. (A body that meets the requirements of EN 45011 (equivalent to ISO Guide 65) shall itself accredit the certifying body);
- open access which means that eco-labelling schemes shall not discriminate in terms of access to certification, and
- accurate information to the consumer implying that the criteria used to assess the eligibility of the product for the eco-label shall be available to the consumer. Product information at the point of sale should also reflect the assessment undertaken.

An EC labelling requirement, to come into effect on 1 January 2002, has also been issued. It requires some fish products to be labelled, indicating the location of the production site, the commercial designation of the species and whether the product is wild or farmed.

Organically certified aquaculture is an important recent development. It is evident that consumer confidence in the safety and integrity of the food supply has been eroded by a number of scandals. A section of relatively affluent, environmentally conscious, consumers have turned to the organic movement to certify the integrity of the products they purchase. They are prepared to pay a premium of up to 75 percent for such products from aquaculture. There are as yet no internationally agreed regulations for organic aquaculture and so standard setting is still largely a private matter although verified by third parties and governed by legislation regarding protection of consumers and fair competition in the market. There are, however, supplementary national regulations in some EC Member States (for instance France and the UK both have national regulations on organic aquaculture). It is anticipated that the requirements that have been codified for other organic products will be extended to aquaculture. These are:

- FAO/WHO Codex Alimentarius "Organically Produced Foods" (1999) , based mainly on the IFOAM Basic Principles  
<http://www.codexalimentarius.net/STANDARD/standard.htm>  
[ftp://ftp.fao.org/codex/standard/organic/g199\\_32e.pdf](ftp://ftp.fao.org/codex/standard/organic/g199_32e.pdf)
- Council Regulation (EEC) No. 2092/91 on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs

The organic market offers a promising future for European aquaculture producers who can meet the requirements. However, the increased production costs, lower productivity and the multiplicity of competing private certifying bodies have so far discouraged most producers from turning to organic production. Despite these obstacles, the organic segment has developed at an interesting pace in recent years. There is some

controversy about whether the whole aquaculture industry will be forced to go organic, but the general feeling is that this will remain a high-value niche segment.

#### **6. IMPACT ON TRADE OF ENVIRONMENTAL AND HEALTH/HYGIENE LEGISLATION: A TRADE BARRIER?**

Recent decisions at an international level and within the EC will impact significantly on the institutional framework for trade in fisheries products, including the products of European freshwater aquaculture. The major trade barrier in the past has been the application of high tariffs to fishery products but these can be expected to be further reduced and in the long term removed through WTO negotiations.

The key measures affecting trade in the future will be rules governing the health and safety aspects of fisheries products, on the one hand, and rules to ensure that fishing and aquaculture are compatible with sustainable development, on the other. The EC as the world's major importer of fish products has a clear policy that the European consumer has the right to be assured that imported products meet the same health standards as those subject to the Community's control. Imports are only permitted from authorised countries included in the Annex to Commission Decision 97/296/EC as amended. For aquaculture products the residue monitoring requirements of Council Directive 96/23/EC, which have applied in the EC are currently being extended to imported aquaculture products.

The application of more stringent food safety regulations, based on hazard analysis critical control point theory and the assessment of risk, constitutes a burden to the small aquaculture operation. However, the changes should be seen in a positive light of providing increased security in the food chain, rather than as barriers to trade. The aquaculture industry will need assistance and training to meet the challenge.

#### **7. MARKETS, DISTRIBUTION AND TRADE**

A problem in the analysis of markets and of consumer behaviour is that most available data is on a very aggregated level. Therefore, information on regional market peculiarities or niche markets often gets lost. This is also the case for consumption data of freshwater species. Clearly more detailed information needs to be obtained on the preferences and consumption patterns of specific consumer groups. Current trends among consumers towards traditional, genuine or more convenient foods is also reflected in the demand for aquaculture products as these are increasingly required to be organic or at least consumer-friendly (filleted, packaged or part of a ready-meal available in the supermarket). In general, European aquaculture producers have drawn limited benefit from these trends. It is also clear that there is a need to increase consumer awareness and improve the image of the industry and its products. In addition, producers should get more market oriented, and over time, adapt choice of species and product forms to market requirements.

Any promotional campaign should be part of an overall strategy aimed at increasing the profitability of the industry and the economic well-being of the operators. The positive contribution to the rural economy by the industry should be emphasised and development programmes for alternative or supplementary economic activities such as recreational fishing, agro-tourism, etc. should be drawn up. Likewise, the use of specific labels denoting geographic origin, traditional production methods or other parameters should be promoted.

Research into the commercialisation of existing under-utilised species should be promoted, and more research on the implications of new requirements of retailers and

restaurants for the freshwater aquaculture industry encouraged. Lastly, more economic research into the demand for freshwater species in the European markets should be undertaken, in order to get a better understanding of how consumers respond to changes in income and prices.

The costs of such undertakings are obvious, as is the realisation that they must be borne by the industry. However, European aquaculture producers should draw heart from the successful examples of the Catfish Institute in the United States, the Norwegian Seafood Export Council, BIM (Irish Sea Fisheries Board) and Scottish Quality Salmon, especially in the field of market promotion and joint industry initiatives.

However, most importantly, the producers themselves must improve their own awareness on what the consumer wants, and their willingness to produce it, not only through research, but also by training, education and improved circulation of information.

## 8. NEW MARKETS, NEW COMPETITORS AND PROMOTION

The European seafood market is in constant evolution, characterised by a slow but steady rise in demand, increased imports from third countries due to stagnant European production, rising demand for fresh and value-added products and reduced demand for unsophisticated frozen and canned products. At the same time, the growing role of supermarkets in food and seafood sales has consequences also for the freshwater aquaculture sector. On the one hand, concentration of demand puts a pressure on producers' margins; on the other hand supermarkets increase overall seafood sales in regions with traditionally low seafood demand through improved availability of product on offer to the consumer.

There is much substitution among products and fast-growing species such as salmon are often supported by promotional campaigns or have special product characteristics that enable them to gain market share in a very short time. An example of the latter is imported fresh fillets of Nile perch, airborne to Europe from Lake Victoria.

Overall international trade in freshwater products is limited, partly caused by high transportation costs compared to product value. Exceptions are frozen trout from Finland and Norway to Japan, eel to China, fresh tilapia from Africa to Europe and from Ecuador and Taiwan to the US, frozen catfish from Vietnam to the US, and fresh Nile perch to Europe from Africa. In these cases, the market price has been high enough to overcome the considerable cost of transportation. The high market price has been possible because of the attractive image of the product in the market place and its strong competitive position in the local market.

Regarding the main freshwater species farmed in Europe, carp and trout, fragmentation on producer level is an obstacle to product development and effective marketing. For carp, a potential market is to be found in the fast-growing ethnic restaurant market, especially Asian and Chinese. However, it has also been suggested that promoting carp demand on this market could result in increased carp imports from third countries.

Both carp and trout suffer to some degree from a very traditional image and lack of product development. Highlighting the positive aspects of freshwater aquaculture and the product characteristics is thought to be necessary in order to increase sales and improve prices and margins. Creating awareness among consumers through promotional activities, following the example of the American Catfish Institute is instrumental in this respect.

## 9. CONCLUSIONS AND RECOMMENDATIONS

At the end of the Workshop all participants contributed to a SWOT analysis (Strengths, weaknesses, opportunities and threats), Appendix 4. The following conclusions and recommendations flow from the discussions and this analysis.

1. A recent study of the freshwater aquaculture sector in the European Community is available<sup>2</sup>, together with a number of reports for the candidate accession countries<sup>3</sup>. However, there is a lack of a comprehensive sector study of European freshwater aquaculture, including impacts from potential competitors. It is **recommended** that available information be integrated and expanded to produce a comprehensive sector study of the freshwater aquaculture sector as an important component of the rural economy.
2. The freshwater aquaculture industry in Europe is product or producer driven along traditional lines and suffers particularly from a lack of vertical integration, linking producers to consumers through the marketing chain. The producers will remain at a disadvantage unless they develop better links through association or cooperation. The success in the USA of the Catfish Institute is an example of what can be achieved. It is **recommended** that producers consider forming stronger links through association or cooperation.
3. Some of the constraints to expansion of freshwater aquaculture could be better addressed if there were more information on consumer preferences and demand. It is therefore **recommended** that support be increased for consumer-oriented economic research directed to market development.
4. While the preparation and implementation of marketing plans is a responsibility of the industry, and must be financed from this source, additional progress and great benefit could be derived from a comprehensive policy framework. Political action is essential to generate coherent development policies. It is **recommended** that regional bodies, national governments and the European Commission undertake the formulation of comprehensive policies for aquaculture possibly including funding for regional development plans.
5. The aquaculture sector is dominated by small or micro enterprises, which often lack technical information, particularly on the impact of legislative changes driven by food safety or consumer considerations. The provision of a coherent flow of information to small producers, supported by training in all aspects of issues covered by new legislation is **recommended**.
6. Aquaculture as a food producing system in some cases has been perceived as being in conflict with other parts of the eco-system. This can best be addressed by the development and dissemination of codes of good aquaculture practice to producers, processors and by accurate information to consumers. In this regard it is also essential that inaccurate press reports be challenged immediately by soundly based scientific arguments (the benefit of a strong producer association is obvious here). It is

<sup>2</sup> **Forward Study of Community Aquaculture**  
[http://europa.eu.int/comm/fisheries/doc\\_et\\_publ/liste\\_publi/studies/aquaculture.pdf](http://europa.eu.int/comm/fisheries/doc_et_publ/liste_publi/studies/aquaculture.pdf)

<sup>3</sup> **Regional Reviews of Aquaculture Development Trends in Europe and former USSR area available on** <http://www.fao.org/fi/body/cifac/SubCom1/review.asp>



recommended that codes of good aquaculture management, feed production and food processing practices be adapted to the needs of the European sector and actively disseminated to all concerned.

7. While the demand for organically produced aquaculture products is growing, certification is still largely based on the standards of private certification bodies. It is **recommended** that a minimum set of common standards for organic aquaculture be produced at European level, with the collaboration of all stakeholders.
8. Trout and carp (about 94 percent) dominate European aquaculture, whereas there are other promising candidates for culture that have not been profitably exploited. It is **recommended** that an investigation of the lack of success with under-utilised species be conducted.
9. Freshwater species suffer from an image of low-value and lack of modernity. Many consumers are also unaware of the positive product attributes of freshwater species. This is exacerbated by lack of marketing aimed at the consumer. It is **recommended** that producers carry out marketing campaigns on a national and international level to raise awareness among consumers and increase the profile and image of freshwater species. Sufficient public funding to part-finance international generic promotion campaigns should be available, and access to it should be made easy.
10. Small- and large-scale aquaculture operations face different problems. Small-scale producers will probably face growing economic problems. As alternatives they could:
  - find special niches for their products, including the possibilities of organic production;
  - integrate with other rural activities such as agro-tourism and recreational fishing or,
  - aggregate into larger operations.

The difficulties of the small-scale sector could be ameliorated by cooperation between producers. This strengthens the recommendation that cooperation be carefully considered by the industry. Large-scale producers are more resilient but need to improve the image of aquaculture products.

## APPENDIX 1

## Agenda

Item	Title	Name(s)
1	Opening and Introductory remarks	<b>L. Váradi</b> , Chairman of EIFAC Sub-Commission II Aquaculture, and Convenor of the Working Party <b>M. Arnal Monreal</b> EC/DG FISH
2	Current state of European freshwater aquaculture products and markets	<b>C. Hough</b>
3	Regulatory framework in EC aquaculture	<b>C. Vamvakas</b> EC/DG FISH
<i>Section 1: Supply Trends in production, new technologies and product development</i>		
<i>Production, products and sales</i>		
4	Product development trends and new products from currently farmed species, including mid- and long-term perspectives	<b>V. Kristensen</b> (in cooperation with <b>D. Gorbaczow</b> )
5	Suggestions for improving sales and distribution of current major freshwater fish species: carp, trout, eel	<b>H. Neubacher</b>
6a	New species-potential developments of currently underproduced species	<b>A. Peteri</b>
6b	Experiences with catfish	<b>S. Vrignaud</b>
<i>Environmental policy</i>		
7	Influence of environmental policies on aquaculture development	<b>R. Rösch</b>
<i>Quality, standards and labelling</i>		
8	Development of policies, best practices and standards for health and hygiene-impact on production	<b>J. Ryder</b>
9	Quality, traceability and labelling	<b>A. Hilbrands</b>

10 Organic products and high quality niche products **S. Bergleiter**

11 Section 1 summary and wrap-up **D. James**

***Section 2: Demand – Markets, distribution and trade***

*Markets and distribution*

12 Review of recent market trends, consumer trends and changes in demand for products from aquaculture and capture fisheries **N. Trachet**

13 Distribution channel development in Europe: Consequences for freshwater fish **M.-C. Monfort**

13add New products in European aquaculture **P. Paquette**

*Institutional framework for trade*

Impact on trade of environmental and health/hygiene legislation: a trade barrier? **R. Bates**

*New markets, new competitors and promotion*

Measures to find and promote new market outlets, promotion campaigns-how to raise the profile of freshwater species **A. Lem**

Competitors from Africa: Tilapia, catfish and Nile Perch **S. Boserman**

Competition among existing (or potential) species farmed in Europe and between aquaculture and other internationalised channels of the food industry (pork, poultry, etc.). **I. Szucs (in cooperation with E. Befeki)**

Section 2 summary and wrap-up **D. James**

***Section 3: Conclusions and recommendations***

*Medium and long term economic viability of the industry*

18 A joint SWOT analysis by the WP, including the drafting of a SWOT table and WP recommendations Contributions from all the members of the WP  
Moderator: **A. Piccioli**

19 Tentative summary and conclusions **D. James / L. Váradi**

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**List of Participants**

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### APPENDIX 3

#### Summary of some codes of conduct and certification programmes that impact on the aquaculture sector

##### FAO Code of Conduct for Responsible Fisheries

Initiated in 1991 by the FAO Committee on Fisheries (COFI), developed in a multi-stakeholder consultation process, and adopted in 1995 by over 170 Member Governments of FAO, the Code of Conduct for Responsible Fisheries (CCRF) represents the most significant globally recognized international framework relating to the world's marine, coastal and inland fisheries, including aquaculture. Based on major international agreements (UNCLOS, UNCED, CBD), the voluntary Code sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with respect for the ecosystem and biodiversity. The Articles of the Code cover all major issues and practices in fisheries, including fisheries management, fishing operations, aquaculture development, integration of fisheries into coastal area management, post-harvest practices, trade, and fisheries research, general principles, and provisions related to its implementation, monitoring, updating, and special requirements of developing countries. Progress in implementing the CCRF, at national, regional and global levels, is monitored and regularly discussed at COFI. However, implementation of all CCRF provisions is far from complete. Many fisheries and aquatic environments continue to suffer from inadequate management, significantly affecting resources and benefits.

The Code includes a section on Aquaculture Development and the FAO Fisheries Department has published technical guidelines for Aquaculture Development in support of the implementation of the Code.

The FAO Code of Conduct focuses more on production process quality than food safety, labelling or traceability issues although these are included in Article 9 (Aquaculture) and Article 11 (Post-harvest Practices and Trade). For more information visit the FAO Fisheries Department website at <http://www.fao.org/ff>.

##### FEAP Code of Conduct

The Federation of European Aquaculture Producers (FEAP) produced a Code of Conduct in the spring of 2000. The primary goal of this Code is to promote the responsible development and management of a viable European aquaculture sector in order to assure a high standard of quality food production while respecting environmental considerations and consumer's demands.

As a Code of Conduct, it serves to establish and recommend guiding principles for those in Europe who are producing live species through aquaculture. The Code does not seek to distinguish between the species nor the types or scales of farms that are encountered within the European aquaculture sector. Its purpose is to establish common ground, through effective self-regulation, for sectoral responsibility within society and demonstrate the considerations of the production sector towards the species it rears, the environment and the consumer. FEAP has developed this Code of Conduct with specific reference to:

- the provisions for responsible aquaculture development contained in the FAO Code of Conduct for Responsible Fisheries (FAO, 1995);
- the FAO Technical Guidelines for Responsible Fisheries No. 5: Aquaculture Development (FAO, 1997);



- the Holmenkollen Guidelines for Sustainable Industrial Fish Farming (Oslo, 1994);
- the Holmenkollen Guidelines for Sustainable Aquaculture (Oslo, 1997);
- the ICES Code of Practice on the Introductions and Transfers of Marine Organisms (Copenhagen, 1994);
- Codes of Practice and Manual of Procedures for Consideration of Introductions and Transfers of Marine and Freshwater Organisms (EIFAC, 1988);
- The Report on the Welfare of Farmed Fish (Farm Animal Welfare Council UK, 1996).

It is assumed that European and national legislation will provide minimum standards for aquaculture. The Code will then serve as the basis for the development of individual national Codes of Practice in order to interpret and apply existing standards and to develop, refine or improve standards, as required.

The FEAP Code of Conduct focuses on production process quality rather than food safety, labelling or traceability issues. No mandatory independent third party verification, certification and/or surveillance is included. For more information visit the FEAP website at <http://www.feap.org>.

#### **EUREP-GAP**

In an interesting development the Euro-Retailer Produce Working Group (EUREP), made up of leading European food retailers, has established a mechanism for drawing up production standards for commodities entering the retail trade through their outlets. Extension to the products of aquaculture started in 2001. This is a particularly important trend as regardless of lower standards prescribed by legislation, products will not enter the retail trade unless they meet the retailer's standard. The EUREP-GAP programme focuses on production process quality, labelling, traceability and food safety. Third party verification by an accredited certification body is required. More information can be found on the EUREP website at <http://www.eurep.org>.

#### **Global Aquaculture Alliance (GAA)**

The GAA is an international non-profit trade association dedicated to advancing environmentally responsible aquaculture and is working to finalize a Responsible Aquaculture Programme of certifiable standards. The GAA programme focuses mainly on the management of shrimp farming and processing operations. Third party verification is required and certified operations can label their products with the GAA logo. More information is available on the GAA website at <http://www.gaalliance.org>.

#### **Marine Stewardship Council (MSC)**

The MSC programme is currently only concerned with the certification of sustainably managed marine resources and chain of custody issues, but may be extended to aquaculture in the future. For more information visit the MSC website at <http://www.msc.org>.

**APPENDIX 4**  
**Strengths, Weaknesses, Opportunities, Threats Table**  
*Medium and long term economic viability of the industry*

	<b>STRENGTHS</b>	<b>WEAKNESSES</b>	<b>OPPORTUNITIES</b>	<b>THREATS</b>
<b>Production trends</b>	<p>Growing trout production</p> <p>Owner operated businesses</p> <p>Farmers' technical skills</p> <p>Capacity for production increase without investment in new facilities (trout)</p> <p>Low production costs (extensive systems, low level trophic chain)</p>	<p>Competition from marine fish</p> <p>Unpredictable production output due to climatic influence (carp)</p> <p>Difficult economic conditions for development (carp)</p> <p>Missing coherent policies (both at national and Community level)</p> <p>Insufficient communication between farmers, associations and policy makers</p>	<p>Local markets</p> <p>Development of on-farm activities (angling, eco-tourism etc)</p> <p>Multi-species production (pond farming)</p>	<p>Competition from marine fish</p> <p>Competition for water resource</p> <p>Lack of coherent policies (both at national and Community level)</p> <p>Protected predators (birds etc)</p>
<b>New technologies</b>	Ongoing research for intensive technology	Very low technical level (pond farming)		
<b>Under-utilised species</b>	Technical background available for many species	High cost of marketing	Potential high demand at least for carnivorous species Some are low level trophic chain species	

	<b>STRENGTHS</b>	<b>WEAKNESSES</b>	<b>OPPORTUNITIES</b>	<b>THREATS</b>
<b>Environment</b>	Positive environmental contribution (carp pond farming) Sustainable industry Potential for an environment friendly intensive production	Investment needed to meet environmental standards (Central & East Europe countries) Differences in national legislation	Co-operation with environmental groups/authorities	Public image
<b>Quality</b>	Good products and processes quality	Lack of information and awareness for farmers	Promote quality of controlled production	
<b>Hygiene standards</b>	Safe products Easy control on safety of production	Poor HACCP implementation	Safe product image HACCP can further improve consumers' confidence	Lack of information on HACCP (small businesses)
<b>Labelling</b>	Easy traceability	Lack of information and awareness for farmers	Promote quality of properly managed production	Incorrect species identification at point of sale Competition from wild fish
<b>Organic products</b>	Market already exists and it is growing Low cost of conversion to organic farming (pond farms) Premium price Consumer information already existing	Organic certification not for highly intensive systems Rejection from (part of) the farmers Certification cost	Increase supply to satisfy growing demand	Lack of minimum common standards for organic aquaculture

	<b>STRENGTHS</b>	<b>WEAKNESSES</b>	<b>OPPORTUNITIES</b>	<b>THREATS</b>
<b>Current market trends</b>	Slowly increasing demand Continuous availability of raw material (trout)	Absence of coherent marketing Lack of concentration of the offer Difficulties to diversify species demand Poor organisation of the producers	Poor fish consumption in Central & East Europe countries Organic product development (as a potential new market) Capture fisheries decreasing yield	Organic product development (if it gives a poor image to the “normal” product) Cheap imports from overseas
<b>Consumer behaviour</b>	Image of the farmer	Lack of knowledge on the industry Poor image of the industry/farmer Consumer uneasy with new species/products In Europe fish is an expensive food for poor economics	Clarify (by legislation) difference between aquaculture and capture fisheries	Failure in the communication strategy towards the consumer
<b>Changes in demand</b>		Lack of investment in product development	Product development	Attitude of the public towards food “Fast food” competition

	<b>STRENGTHS</b>	<b>WEAKNESSES</b>	<b>OPPORTUNITIES</b>	<b>THREATS</b>
<b>Distribution channels</b>	Potential for direct marketing (family businesses)		Further development of direct sales at farm Development of supermarkets in regions where fish consumption is low Many different (potential) outlets	
<b>New products</b>	Need for raw material for the processing of new products	Production cost of highly processed new products	Enlargement of number of farmed species Demand for diversified species by the processors, in order to offer a large range of products	Irregularity of the supply (extensive aquaculture)
<b>New markets</b>			Enlargement of product variety	
<b>Competitors</b>			Increased demand in Asia	Incorrect species identification at point of sale Development of Asian production

## APPENDIX 5

## Papers Presented

## Current state of European freshwater aquaculture products and markets

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## ABSTRACT

A review of the situation of freshwater aquaculture in Europe with consideration of available development options.

## Introduction

In 1984<sup>1</sup>, European<sup>2</sup> freshwater aquaculture produced 280 000 t having an estimated value of US\$ 713 million, equivalent to US\$ 2.56/kg. By 1998, production had risen to 331 000 t worth US\$ 1 001 million, having an average value of US\$ 3.03/kg. The APR for production in this 14-year period was 1.3 percent, while the value APR was 2.5 percent, reflected in an average annual increase in value of 1.2 percent.

This can be compared to the figures seen for marine aquaculture in Europe during the same period, which rose from 655 000 t to 1 526 000 t (APR 6.2 percent). The value rose from US\$ 713 million (US\$ 1.09/kg) to US\$ 3 044 000 (US\$ 1.99/kg) at an APR of 10.9 percent.

These 'macro' figures nonetheless hide the details of different patterns and events that underline the growing differences between the freshwater and marine aquaculture sectors in Europe.

## Production developments

In 1998, freshwater aquaculture was dominated by fish production (99.9 percent) where salmonid fish species were the leading products (68 percent of the total). Of the salmonid species produced, 98 percent (221 000 t) were rainbow trout (*Oncorhynchus mykiss*), the second most important species (1.1 percent - 2 500 t) being brown trout (*Salmo trutta*). Cyprinid species amount to 26 percent (86 000 t) of the total, a figure that has decreased steadily from the high figure of 159 000 t seen in 1989. The two major species groups produced in freshwater account for 94 percent of European freshwater production.

Of the remaining 7 percent, 3 percent are accounted by eel farming and the remaining 4 percent by miscellaneous freshwater fish species. Freshwater production of crustaceans and molluscs is of minimal importance.

During the period 1984-1998, the major developments were:

<sup>1</sup> Source: Fishstat (FAO:2000)

<sup>2</sup> Including Albania, Austria, Belgium, Bulgaria, Croatia (in Yugoslavia SFR up to 1991 incl.), Czech Republic (Czechoslovakia up to 1992 incl.), Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Macedonia, Former Republic of Yugoslavia (in Yugoslavia SFR up to 1991 incl.), Netherlands, Norway, Poland, Portugal, Romania, Slovakia (Czechoslovakia up to 1992 incl.), Slovenia (in Yugoslavia SFR up to 1991 incl.), Spain, Sweden, Switzerland, United Kingdom, Yugoslavia SFR (up to 1991 incl.), Yugoslavia, Fed. Rep. (from 1992)

1. A decrease of carp [cyprinid] production from a high of 160 000 t (1989) to 86 000 t (1998), after a rise in production in the mid-1980s (APR -3.5 percent), where prices have increased only marginally (APR 0.4 percent).
2. A rise in salmonid farming (including rainbow and brown trout, arctic char and others) from 130 000 t to 226 000 t (APR 4.0 percent) but where price values have been stagnant.
3. The only sub-sectors that have shown any significant growth are:
  - Eels – moving from 1 900 t to 9 000 t (APR 11.7 percent), with a reported increase in price from US\$ 4.22 to US\$ 9.31 (APR 5.8 percent)
  - Miscellaneous fish species – rising from 4 600 t to 8 000 t (APR 4.2 percent), but with only a small price increase to US\$ 3.12 (APR 0.5 percent)

On a regional basis, there are additional differences. If one separates the European Union countries as a separate entity, one can see the following:

- (a) Freshwater aquaculture in the EU is dominated by trout production
- (b) Carp production has remained relatively stable but is in decline
- (c) Diversification towards other freshwater species has developed small production sub-sectors for species such as eel, sturgeon and catfish.

In the non-EU countries of Europe, freshwater aquaculture is mainly in inland Eastern Europe and here the observations are:

- (a) The major products of freshwater aquaculture are carps and production has halved between 1989 and 1998 (dropping from 127 000 t to 64 000 t).
- (b) Apart from some small rises for individual species, the only significant growth has been for rainbow trout, increasing from 3 400 t to 13 000 t (APR 10.1 percent)

If these circumstances are compared to marine aquaculture in Europe, one can see that the developments in salmon and Mediterranean fish farming, accompanied by significant increases in marine shellfish production, have allowed the marine sector to develop as demonstrated in the following table.

**Table 1**

Comparison of marine and freshwater aquaculture development in Europe  
(Source: Fishstat (FAO) 2000)

European Aquaculture		Marine Aquaculture		Freshwater Aquaculture	
FAOSTAT Group		1984	1998	1984	1998
Aquatic plants	Production (t)		3,062		
	Value US\$		1,040.00		
	Price US\$		0.34		
Crustaceans	Production (t)		245	25	95
	Value US\$		1,811.00	266.00	2,026.00
	Price US\$		7.39	10.64	21.33

European Aquaculture		Marine Aquaculture		Freshwater Aquaculture	
FAOSTAT Group		1984	1998	1984	1998
Demersal marine fish	Production (t)	759	71,420		13
	Value US\$	7,546.00	495,371.00		134.00
	Price US\$	9.94	6.94		10.30
Freshwater and Diadromous Fish	Production (t)	42,722	584,162	278,053	330,780
	Value US\$	208,773.00	1,688,213.00	712,642.00	998,706.00
	Price US\$	4.89	2.89	2.56	3.02
Marine fish nei	Production (t)		2,166		
	Value US\$		8,910.00		
	Price US\$		4.11		
Miscellaneous aquatic animals	Production (t)		33		41
	Value US\$		132.00		123.00
	Price US\$		4.01		3.00
Molluscs	Production (t)	607,760	861,796		4
	Value US\$	491,654.00	834,457.00		12.00
	Price US\$	0.81	0.97		3.00
Pelagic marine fish	Production (t)	3,480	3,604		73
	Value US\$	5,197.00	14,555.00		321.00
	Price US\$	1.49	4.04		4.40
<b>Total Production</b>	<b>t</b>	<b>654,721</b>	<b>1,526,488</b>	<b>278,078</b>	<b>331,006</b>
<b>Total Value</b>	<b>US\$</b>	<b>713,170.00</b>	<b>3,044,490.00</b>	<b>712,908.00</b>	<b>1,001,323.00</b>
<b>Total Price</b>	<b>US\$</b>	<b>1.09</b>	<b>1.99</b>	<b>2.56</b>	<b>3.03</b>

Marine fish farming has moved from representing less than one third to nearly 60 percent of the value of marine aquaculture within the period examined. While in 1984, freshwater fish farming produced nearly seven times more product than its marine equivalent in 2000, it had decreased to only half the figure of marine fish farming.

It is impossible to avoid the conclusion that freshwater aquaculture has been overtaken by marine aquaculture in both importance and diversity, as a result of different limiting factors that have reduced development and caused stagnation in much of the sector. The task of identifying these factors is not simple and the core question is whether they are factors that can be resolved in order to allow further successful sectoral development.



### Structure of the freshwater aquaculture sector

It is impossible to analyse the factors affecting the development of the freshwater aquaculture sector without understanding its key characteristics:

1. Production is influenced by two main factors, namely the climate and the water available at a specific site. These effectively determine whether one produces cyprinids or salmonids.
2. Water limitations have traditionally governed the maximum production capacity for a location, limiting the ability to increase production.
3. Environmental legislation concerning the waste loading of a site/farm has largely replaced the water limitation criteria.
4. Production limitations have restricted corporate growth, keeping the sector as [very] SME, dominated by family-owned and operated units.
5. The geographic location of farms is highly dispersed, although climatic suitability leads to a degree of regional localisation.

In the EU there has been a degree of concentration of production in certain areas leading, in some cases, to the introduction of cooperative structures, primarily to develop economic resources to allow processing and distribution. In other cases, mergers and buy-outs have led to the creation of larger SMEs capable of approaching the multiple retail sector with 'consumer-friendly' products.

In the Central/Eastern European countries, the policy of adapting to market-led economies and the dismantling of some of the large [State-run] entities responsible for freshwater aquaculture has led to the creation of family-run SMEs similar to the situation seen in the EU.

Compared to the marine aquaculture sector, where multinational and public companies exist, the freshwater sector remains typified by small, owner-operated entities.

### Markets for freshwater aquaculture products

There are three clear market areas available to the producers of freshwater fish:

1. Food (consumption) market, which can be sub-divided into
  - Local market (i.e., geographically close)
  - Multiple [retail] market (i.e., supermarkets)
  - Export markets
2. Restocking market
  - For stock enhancement and environmental purposes
  - For sport fisheries
3. Sport Fisheries
  - On-farm

### Food market

Obviously, the nature of the market can be influenced by the species produced (and vice-versa), but the food market remains the dominant area for all freshwater aquaculture.

The social and economic changes occurring in Central and Eastern Europe have also changed local market opportunities, particularly given the rising availability of other inexpensive food products. Carp consumption in Germany (the main EC consumer of carps) is increasingly

restricted to the festive seasons and the production cost differences, compared to non-EC countries, have caused increased imports of carps and lowered production in this country.

On the other hand, the trout market has been subject to a lot of product development. Consumer-friendly products are now available, manufactured according to the highest standards and appropriately packaged. This has partially allowed the trout sector to keep pace with developments made by other food suppliers.

Within the fish marketing sector it is difficult to escape the demand for filleted products – ready-to-cook or ready-to eat. The rapid disappearance of the fishmonger, being replaced by the self-service counter in the supermarket, has imposed this simple fact – the (EU) consumer does not want to clean and fillet fish.

This means that, in the European Community at least, future products of freshwater aquaculture must be desirable and follow the demands of the consumer.

At present, there is a degree of interest in the production of 'organic' freshwater fish species. While many of the carp producers would argue that their production is already 'organic' (by virtue of the production techniques employed), the trout sector has been slower to adopt this principle. This has been primarily due to difficulties in obtaining the prices required to justify the drop in productivity encountered for 'organic' certification. This is obviously a question for further investigation.

The export potential of European freshwater aquaculture is very limited and restricted to small internal movements in the EU and from non-EU to EU in certain cases. There is next to no export of freshwater aquaculture products from Europe to other areas of the world.

#### **Restocking market**

The market for restocking fish into rivers, lakes and reservoirs is of interest and should increase. There is an apparent desire to return species that used to be abundant in specific areas (e.g., salmon in rivers, sturgeon in the Gironde estuary) or to have 'traditional' species for sport fisheries (e.g., brown trout, perch etc.).

For the salmonid sector, juvenile Atlantic salmon, brook trout, brown trout and rainbow trout are produced by hatcheries Europe-wide for enhancing native stocks or for restocking purposes, destined for sport or recreational fisheries.

'Coarse' fish (non-salmonid species) are also in demand. They offer sporting value and include bream, carp, perch, pike, roach, rudd and tench, all providing specific opportunities for the sector.

In addition, the position of endangered species needs to be considered. One of the best documented is that of the European eel. Consideration should be given to the scope for restocking eel fingerlings (grown on from glass eels) for restocking programmes, on a Europe-wide basis, in order to counter the evident problems for the recruitment of eels in European waters.

#### **Sport fisheries**

One of the more promising outlets for European freshwater farms is the development of sport fisheries. Although such opportunities appear to be quite variable, depending on the public interest given to angling, sport fisheries (sometimes linked with tourism opportunities) can be a viable alternative to the traditional food/consumer markets.

In the United Kingdom, for example, freshwater angling is an extremely popular sport and increasing numbers of farms are turning to the creation of 'sport' waters within the farm site or in adjacent/close properties. Landscaped, and sometimes with restaurant facilities, such enterprises are meeting with increasing success. These circumstances provide added value, extra economic opportunities and diversification in line with the core activity.

## **Conclusions**

Freshwater aquaculture in Europe is clearly subject to a variety of problems whose final effects are stagnation in both production and markets. Focus is on the production of carp or trout and few alternative species are available as attractive practical or economic options.

Development options that are available appear to be the provision of products that are readily acceptable by the consumer, since there is little possibility for the successful market development of 'minor' species. Alternatively, adapting production to developing consumer trends (e.g., organic production) or to societal requirements (e.g., restocking) are changes that require market or policy support.

Increasingly, farms may focus on local market development as the most viable alternative to the multiple retail outlets, developing products (and an image) designed for local appreciation. Additional options available may be linked to developing sport fishery opportunities, linked to local tourism development.

Whatever options are developed and/or promoted, support from clear and coherent policies is required, respecting both the nature of the activity and the role of the sector within European aquaculture.

## **Regulatory framework in European Community aquaculture**

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### **ABSTRACT**

The aquaculture industry as a whole has slowly but steadily increased its importance over recent years in the European Community. Plausible scenarios for the medium-term future suggest that the European aquaculture industry could increase further in the coming years.

### **Introduction**

The Commission considers that aquaculture can contribute further to reduce the substantial deficit of fish supply in the Community and to create employment in areas where alternatives to fish-based enterprises are rare. Because of this, the Community gives financial aid to aquaculture development in the framework of the Community Structural and Research policies.

In the meantime, aquaculture development must be carried out taking account of a number of other aspects, going from consumer's health safety to appropriate market strategies, through environment protection, etc.

Consequently, aquaculture producers face an extremely bulky set of Community norms and regulations that, even if not specific to aquaculture, have an impact on it.

A directory containing the most important regulations, directives and decisions currently in force, which concern aquaculture, processing and marketing of fisheries products has just been finalised. This directory will be the nucleus of a database, which will be put on the Commission's Internet site on the page of DG Fisheries ([http://europa.eu.int/comm/fisheries/doc\\_et\\_publ/faetsheets/legal\\_texts/aquaculture/index\\_en.htm](http://europa.eu.int/comm/fisheries/doc_et_publ/faetsheets/legal_texts/aquaculture/index_en.htm)). The database will be revised regularly.

The directory currently contains no less than 350 acts that are in some way of interest for the above sectors. Approximately half of them can have an importance for aquaculture producers. A quick overview of the key legislative acts by main themes is given below.

### **Environmental legislation**

Environmental protection has assumed a central role in the objects of the European Community. In particular, there is a commitment to integrating environmental concerns into all policy areas covered by the EC Treaty.

While the environmental provisions contained in and adopted under the EC Treaty do not make up a complete environmental code (they are supplemented by a wide range of national laws), and while they do not create a specific framework for aquaculture, they have a considerable relevance for the sector. This can arise in at least three ways.

First, the Member States are required to ensure that all aquaculture enterprises operate within the rules. Most of the legislation takes the form of directives, i.e., instruments adopted by the Community which need to be translated into detailed national rules and procedures.

Second, when the European Community is carrying out actions in relation to aquaculture (for example, approving aquaculture programmes in particular Member States under the Structural Funds), it is obliged to integrate environmental protection requirements into its work.

Third, aquaculture can benefit from Community environmental legislation. In particular, legislation aimed at protecting the aquatic environment can help to safeguard aquaculture activities from damage to their resource base, for example by providing for controls on polluting discharges from neighbouring activities.

## Outline of relevant EEC environmental legislation

### (a) Location and other environmental constraints

In the siting of aquaculture activities, it is important to have regard to EC legal requirements governing the quality of the surrounding environment. Broadly speaking, such requirements can be divided into two categories.

In the first category are nature conservation requirements. These are principally found in Directive 79/409/EEC on the conservation of wild birds and Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. These directives, amongst other things, seek to establish a European network of protected habitats for vulnerable species of flora and fauna (Natura 2000). Activities capable of affecting such habitats are to be subject to various controls.

The second category of requirements relates to water quality standards. In the 1970s, a number of directives were adopted with a view to ensuring that, for various water bodies, water quality standards would be sufficient to guarantee certain beneficial uses of water. These instruments fix standards for various types of waters (for instance, Directive 76/160/EEC on the quality of bathing water, Directive 75/440/EEC on drinking waters, Directive 78/659/EEC on the quality of fresh waters in order to support fish life, Directive 79/923/EEC on the quality required of shellfish waters).

Since October 2000, Directive 2000/60/EC establishes a framework for Community action in the field of water policy. This directive, which will repeal by December 2007 most of the previous "water" directives, lays down a new basis for co-ordinating the Member States' policies and measures to protect water resources. It will establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater.

It lays down environmental quality standards at Community level for a certain number of pollutants that are listed in its annex. However, it does not lay down limit values for pollutant emissions, but co-ordinates the application of those required by other legal texts. Other environmental quality standards are laid down by the Member States for water abstracted for drinking purposes.

The Directive is thus intended to protect the available water resources in the long term by introducing:

- river basin water management;
- monitoring of the chemical, ecological and/or quantitative status of surface waters and groundwater in each river basin;
- pollution-measurement programmes.

It also requires the Member States to take action in order that the price of water reflects the total cost of all of the services linked with water use, together with environmental costs and resource depletion costs.

Apart from the above, the possible significance of certain international wildlife conventions should also be noted. For example, the Community is a party to the Convention on the conservation of European wildlife and natural habitats (Bern Convention), the Convention on biological diversity, the Convention on the protection of the Mediterranean Sea against pollution (Barcelona Convention), the Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention) and the Convention for the Protection of the Marine Environment of the North-East Atlantic (Paris Convention). These conventions commit parties to avoiding or minimising damage to wildlife sites, to protecting flora and fauna, to safeguarding biodiversity and integrating the principle of sustainable use into development policies. Such commitments may be relevant when examining whether the

proposed use of Community finance for particular aquaculture proposals is compatible with Community environmental policy.

(b) Procedural formalities and authorisation requirements

Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment<sup>3</sup> embodies the "preventive approach" to environmental protection by requiring that, before a development consent is given, certain projects likely to have significant effects on the environment are subject to an assessment of possible environmental impacts. One of the project classes covered by the Directive is "intensive fish farming". An impact assessment must be carried out for a project falling into this class where a Member State considers that the project's characteristics so require. In this regard, practice varies between the Member States as to when an assessment is deemed necessary.

Directive 76/464/EEC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community creates a framework for the control of the introduction of certain dangerous substances into the aquatic environment (including biocides and organic substances associated with aquaculture activities).

(c) Operational controls

Once an aquaculture activity has been established, European Community environmental rules remain relevant. For example, it will be necessary through monitoring (and possibly enforcement action in some cases) to ensure that aquaculture enterprises respect the emission standards fixed for them under Directive 76/464/EEC and that they do not compromise the standards which apply to the ambient environment under water quality and nature conservation instruments.

There may also be restrictions on the sorts of chemicals that can be employed in an aquaculture activity, under a set of Directives relating to restrictions on the marketing and use of certain dangerous substances and preparations.

(d) Protecting the resource base

Community environmental legislation can be considered not only from the perspective of a set of controls on aquaculture but also from the perspective of a set of controls on other activities that may negatively affect aquaculture.

Directive 79/923/EEC is an example of this, aiming as it does to protect the water resource on which shellfish depend. The general regime for pollution discharges established under Directive 76/464/EEC and subsidiary directives is another example. This Directive provides a basis for controlling discharges of dangerous substances from industrial installations and other sources, and to the extent that such substances may be harmful to aquaculture (for example, heavy metals), the Directive contributes to securing safe conditions for the sector to operate in.

Another important instrument is Directive 91/271/EEC concerning urban wastewater treatment. By requiring improved treatment, the Directive should contribute to achieving better environmental conditions for aquaculture.

### Hygiene in foodstuffs

The European Community legislation on hygiene in foodstuffs is complex. Consolidation and codification had progressed under the Simplification of Legislation for the Internal Market (SLIM) initiative with a draft proposal, merging 16 Council directives on animal public health with the food hygiene legislation. The proposal was developed in consultation with member

<sup>3</sup> Last amended by Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment.

states and interested parties, including the aquaculture sector, over a period of more than 2 years. The final text of 4 regulations and one directive was adopted by the Commission in July 2000 and forwarded to the Council and the EP. Under co-decision, this is expected to be adopted by June 2002.

These proposals result from a recast of Community legislation on

- food hygiene as contained in Council Directive 93/43/EEC on the hygiene of foodstuffs and in a number of Council Directives on public health problems and governing the production and placing on the market of products of animal origin,
- animal health aspects related to the placing on the market of products of animal origin, as contained in a number of Council Directives that partially overlap with the food hygiene Directives,
- official controls on products of animal origin contained in the above product-specific Directives.

The recast is primarily motivated by the need to ensure a high level of health protection for the different disciplines concerned. The leitmotif throughout the recast of the hygiene rules is that food operators bear full responsibility for the safety of the food they produce. The implementation of hazard analysis and control principles (HACCP or "own checks", which has applied in the fisheries sector since 1994) and the observance of hygiene rules must ensure this safety.

In addition, provision is made for the hygiene rules to be applied at all levels of the food chain, from primary production to delivery to the final consumer.

Finally, products of animal origin may carry pathogens which can seriously affect the health of animals coming into contact with such products. Although not harmful to humans, such products may cause serious losses and restrictions on the farms affected by such problems. The recast of the veterinary rules has helped to better identify these problems and define the measures that need to be taken in order to prevent the spread of animal diseases through products of animal origin.

The proposed Directive will repeal previous related texts. Obviously, health protection legislation applies to both European Community products and products imported from Third countries.

How will this affect fish farmers? The main point is the introduction of the concept that primary production has to be carried out in accordance with good hygiene practice. Farmers will be required to keep records relevant to health protection (origin of feeding stuffs, animal health status, use of vet medicines etc). It is not expected that new regulations will result in a significant increase in requirements for aquaculture, because current rules already cover most of these requirements.

Still on the sanitary side, another bulky set of European legislation concerns the veterinary checks for intra-Community trade, for live animals to be imported from third countries, and for mollusc biotoxins. It is important to mention Council Decision 93/383/EEC that created a network of reference laboratories for the monitoring of marine biotoxins. The work of these laboratories is of paramount importance for shellfish farmers.

It should not be forgotten, moreover, the potential impact to human health that some products used for animal feeds could have. In this framework, Council Decision 2000/766/EC concerning certain protection measures with regard to transmissible spongiform encephalopathies and the feeding of animal protein, recently banned the use of terrestrial animal meals in fish feeds.

## **Disease**

The two main Community acts concerning the prevention of the spread of aquaculture diseases are Council Directive 91/67/EEC, concerning the animal health conditions governing the placing on the market of aquaculture animals and products, that establish a fairly detailed procedure for recognition of disease-free zones and more in general for movements of live fish and shellfish throughout Europe, and Council Directive 93/53/EEC of 24 June 1993 that introduces a set of minimum Community measures for the control of certain fish diseases.

These are completed by a number of other accessory acts giving details on, for instance, sampling plans and diagnostic methods for the detection and confirmation of certain fish diseases, or on the disease-free zones for a given disease, or on procedures to be followed for imports from Third countries.

They are too many to be described. It will only be quoted here Council Decision 90/424/EEC on expenditure in the veterinary field that, in connection with Commission Regulation (EC) No 2722/2000, establishes the conditions under which a Community financial contribution can be given towards eradication campaigns for certain aquaculture diseases.

The Commission services are currently working on the revision and updating of the whole body of aquaculture disease legislation, and it is realistic to expect that a more comprehensive and synthetic act will be proposed to the Council in some time. But this will not happen in the forthcoming months.

Still linked with disease control, Council Regulation (EEC) No 2377/90 lays down a Community procedure for the establishment of Maximum Residue Limits (MRLs) of veterinary medicinal products in foodstuffs of animal origin. This Regulation created some problems to the aquaculture industry in the recent past, as the mentioned procedure is quite expensive and the drug companies were not interested in affording the costs of aquaculture medicines registration due to the small size of the industry and, consequently, of the demand for specific drugs. This has been overcome in most cases nowadays, thanks to the extension to fish of many MRLs fixed for terrestrial animals.

## **Market**

Many provisions of Council Regulation (EC) No 104/2000 on the common organisation of the markets in fishery and aquaculture products are of interest to the aquaculture sector. For instance, it is possible to set up producers' organisations in the aquaculture sector, and by this improve marketing co-ordination and the quality of their products.

Market legislation is also dealing with Community tariff quotas and duties for the import of certain aquaculture products from Third countries.

## **Others**

A mention should be made of some other acts with some relevance for aquaculture.

Council Regulation (EC) No 788/96 on the submission by Member States of statistics on aquaculture production is used by Eurostat to collect statistical information on the sector.

Council Regulation (EEC) No 2081/92 on the protection of geographical indications and designations of origin for agricultural products and foodstuffs allows for the recognition of local specificity of aquaculture products. Some of them, in the shellfish sector, have already received an EC official recognition.

Council Directive 91/628/EEC on the protection of animals during transport is also, at least theoretically, relevant to aquaculture.



## Financial aid

In recent years, the aquaculture industry has been required to make significant investments and these are still continuing today, mainly due to the increasing constraints from environmental concerns and from competition for space and aquatic resources and, on the other side, the rapidly changing conditions (threats as well as opportunities) of the market.

Public financial assistance to the aquaculture industry has to be seen in this context. It is a legitimate instrument in the European Community's regional cohesion policy, as aquaculture businesses, as a matter of fact, are mainly present in areas whose economies are structurally lagging behind.

The Community is supporting aquaculture enterprises essentially in two ways:

- by funding research and development through the Community Research and Technological Development (RTD) Framework programme. This started in 1989 with the Fisheries and Aquaculture Research Programme (FAR) which ran for five years providing €13.3 million for aquaculture. It was followed by the AIR programme (Agriculture and the Agro-industry, including Fisheries, 1991-1994) which funded 34 aquaculture projects with grants totalling €18.5 million and by the Agriculture and Fisheries Programme (FAIR) 1994-1998. The Fifth Framework Programme (1998-2002) will continue to give support in strategic areas. However, the bulk of the investment in aquaculture research is provided by European Community Member States' national research programmes and by the industry itself.
- in the framework of Structural Funds, as capital grant contributions to the physical investment of production projects. This is done by the Financial Instrument for Fisheries Guidance (FIFG), as defined by Regulation (EC) No 2792/1999 laying down the detailed rules and arrangements regarding Community structural assistance in the fisheries sector.

This regulation supports many investments in the fisheries sector, including aquaculture private productive projects. In these cases a financial participation from the private investor is always requested, which can differ between 40 percent and 60 percent of the total investment, according to areas.

The emphasis for grant aid is put into avoiding adverse effects such as a build up of excess production capacity, to concentrate on investments which aim to improve the environment, and collective actions involving professional fish farmers.

The influence of aquaculture on the environment is of paramount importance and this is reflected in the regulation by requiring all grant aided aquaculture projects involving intensive methods to conform to the provisions of Directive 85/337/EEC. In this context the costs relating to environmental impact studies are eligible for aid.

In order to encourage clean operations, project investments using technology which will substantially reduce negative effects on the environment may benefit from an additional financial aid of up to 10%.

The collection of information for a database or the creation of models for environmental management as part of an integrated coastal zone management is also eligible for aid.

The eradication of certain aquaculture diseases is eligible to FIFG funds.

Pilot projects are eligible and the level of public aid is higher than for normal production investment. These projects aim to establish and to distribute technical and economic knowledge. Scientific monitoring and a scientific report to the management authority are now requested.

## The future

The European Commission will prepare its formal proposals for changes in Common Fisheries Policy legislation before the end of 2001. The Commission has recently presented to the Council and to the European Parliament the report on the situation of fisheries in the Community and a Green Paper in which it sets out the options for the future fisheries policy and the possible amendments to Community law.

Using the Green Paper as a basis, the Commission is initiating an intensive public debate on all areas of the CFP until the end of this year.

The key statements concerning aquaculture in the Green Paper are:

- Aquaculture has played a significant role in the improvement of the socio-economic situation of coastal communities. Nonetheless, it still experiences a number of problems. In particular, as aquaculture expands, it is increasingly seen as a threat to other activities. The tourism industry is especially critical of aquaculture, which is blamed for occupying space that could be used for recreation, as well as for producing waste materials that affect the quality of nearby bathing water. In order to ensure a stable future for aquaculture, it is important to address these conflicts with other users of the coastal zones.
- Food quality is a high priority for the Community and fisheries products will be affected in the immediate future by the current overhaul of Community food legislation which is designed to establish the highest standards for food. This may lead, for example, to the establishment of stricter limit values for contaminants, such as heavy metals or dioxins. The correct application of Community health requirements will have different effects on the fisheries sector. The need for structural adjustment resulting from the fulfilment of the Community health requirements will have to be taken into account in Member States' programmes for assistance to the sector within the framework of the Financial Instrument for Fisheries Guidance (FIFG).
- The relations between aquaculture and the environment are extremely important. Adoption of sustainable farming practices must be achieved, alongside the imperatives of health and quality standards for products. The Biodiversity Action Plan for fisheries and aquaculture should contribute to achieving this goal. The Plan should foresee a series of actions related to the reduction of environmental impact as well as actions to limit the potential problems arising from the introduction of new species and secure animal health. These actions need to be supplemented by research related to aquaculture.
- Competition from international trade has also affected Community aquaculture during the last decade. The market has to be the driving force of aquaculture development. Production and demand are currently finely balanced and any increase in production in excess of the likely evolution in demand should not be encouraged. In the 1980s, aquaculture (and more particularly, marine aquaculture) was still essentially a high-risk activity. Today, these risks no longer exist for a number of farmed species. It is therefore questionable whether the Community should continue to subsidise investments by private companies in production capacity for species where the market is close to saturation.
- The intervention of the public authorities in favour of aquaculture should in future cover measures other than aid to investments that increase production for species where market is close to saturation, covering expenditure such as training, control, research and development (in particular for new species), processing of waste water, eradication of diseases, etc. As from 2000, the scope of the FIFG has been widened, in order to include the majority of such aid. Public aid should in particular be devoted to encouraging the development of « clean » technologies.

**Product development trends and new products from currently farmed species,  
including medium- and long-term perspectives**

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**ABSTRACT**

The contribution is a trout farmers view on perspectives of aquaculture production and product development in the European Union. It questions the un-coordinated environmental regulations and production control measures applied in some countries and stresses the need for a clear common policy in the European Union. This will be necessary if aquaculture is to remain a viable sector of food production.

**Introduction**

It is a well-known fact that freshwater aquaculture production has not grown as fast as that in marine waters. Salmon, seabream and seabass in particular have had an impressive increase during the last decade. The range of salmon products has expanded, maybe not rapidly, but surely faster than any other species.

Aquaculture is often thought of as a new and young industry. In a certain sense this is true but the present volume of production is unprecedented. At the same time, the amount of wild fish harvested is decreasing, which of course means that aquaculture is providing a growing part of fish available for human consumption.

The origin of aquaculture dates back more than 1 000 years; in Denmark trout farming has existed for more than 100 years. During this period it has seen steady growth with a significant increase in the 1970s and 1980s as a result of the introduction of pelleted dry feed.

This period was also one of growing concern for the environment. As environmental issues became more and more important on the political agenda, more adverse attention was focussed on trout farming.

This was actually not really fair, because alongside growing concern for the environment, the impact from trout farming was decreasing year by year. Pollution from trout farms, as seen in the 1960s and early 1970s, is in many instances the picture people still see – and this creates a bad image of the industry. It is worth mentioning that mistakes (including pollution) made over 30 years ago are still an issue when discussing development of the industry. Trout farmers and trout associations still have to explain and educate people to convince them that the impact today, compared with the 1970s, has been minimized and controlled.

**The Trout farmers in Denmark as an example**

In 1989 environmental legislation set limits on several parameters, most importantly on feed volume used in each farm, and on various discharge levels. It was anticipated that the goal would be hard to reach, and failure would result in production cuts.

Phosphorus input to the environment was set as a maximum of 650 t per year, to be achieved after 5 years from 1994. Trout farmers started to collect data, and the big surprise was that in 1992 it was only 120 t per year, and today it is down to 34 t.

It is incongruous that establishing a goal of 650 t, discovering emissions to be only 120 t and achieving 34 t per year, did not make headlines. The people setting the goals do not even want to

comment on these facts. This and the fact that they did not immediately give the industry credit is still a mystery.

The reduction was mainly achieved by the development of new feeds by clever people in the feed industry, but there was also a lot of investment in mechanical and biological systems by the farms. In some cases this was financed with EC funds.

Another regulatory measure was to establish a ceiling for the ratio feed/production. This limitation for production increase unfortunately was implemented only in one country (Denmark).

If production control had been implemented in all trout producing countries, it would then have been meaningful and have generated higher prices, less discharge and probably the same profit for the farms. In Denmark it moved production to other countries with little or no regulation. If that was the intention of the Danish Government it was successful. If, however, the aim was to decrease aquaculture in European waters, it definitely failed.

These actions stopped all investment and development in Denmark and in ten years turned the leading trout farming country into one of the smallest producers in Europe, with frustrated farmers.

### **Product development**

There is a long distance from an idea to the market. A new product can be many different things:

- a new technology to the producer, distributor or consumer
- a new process to the producer or the distributor
- a new product to the producer, distributor or consumer

This is just to explain how complex it can be to discuss these issues. At all levels, users of a new technology, process or product have ideas and expectations that can be different. The most important issue is that, when funds and money are to be spent, it is very important that project evaluation should be undertaken by professionals.

Why is it that freshwater aquaculture has failed in product development to other species (e.g., salmon)? It could be the general stagnation in freshwater fish production. Rapid growth and a huge amount of fish, which the market cannot absorb, will automatically lead to price drops, maybe even dumping, which is a well-known problem.

What might be less well known, is that production restrictions, leading to stagnation, may be imposed by governments. This leads to worst case situations where the industry has no capacity to improve, to develop new products and new technology. If the EU attempted to control production growth, it would most probably just lead to moving the production and development to other parts of the world.

If the producers cannot gain any profit from improving, they will not improve, which is a very human reaction valid not only for aquaculture farmers. The European market could easily turn from being the market leader to a consumer market for cheap products imported from countries outside the European Union.'

The warning is clear: imposing production limitation (stagnation) is not the way to create a viable industry.

Product development has been a feature in eel farming where production is technically demanding. This means the farms have to have a certain size to be profitable.

Recently a kabayaki processing industry was started in Denmark, and it was very successful, as long as the Japanese market was buoyant. After the collapse of the Japanese economy the perils of having only one market and one product became obvious. The only thing this plant could do, was to dump their raw products on the fresh and frozen market without processing. This caused the frozen, fresh and live markets to collapse as well. The EU market has not fully recovered after eight months. The Japanese traditional product with a history of 1 200 years is now being put on the European market. It will be very exiting to follow.

### **Problems**

Besides low prices and image problems, another threat facing freshwater aquaculture is the variation in regulations from country to country (also within the EU). It might be a good idea to discuss, whether there is a common basis for regulation with rules that are the same in all EU countries.

Today environmental legislation is different in each country, depending on the government in power when the regulations were implemented. For fair competition and for the image of the industry, this has been very difficult to handle.

Some countries with strong environmentalist pressure apparently decided that aquaculture was growing too fast, and convinced governments to stop growth. Other countries see sustainable aquaculture as the only solution for the future as wild stocks are becoming smaller and smaller.

If food safety develops in the same way, confusion will be found in the supermarkets. Today, consumers do not know what an "organic product" means. This is understandable when you see all the different rules, not only for different products, but also for different countries. Trust is disappearing, not because they do not want to know, but because the jungle of certificates and different rules in different countries of origin makes information and education of the consumer impossible. The lack of interest for organic products is based on this hopeless confusion. Why pay more for a product if you do not know what you get?

This leads to the wishing part. A clear policy is needed for progress. It is rarely found in the different EU countries but if the EC wants a viable freshwater aquaculture sector, that can be proactive in the future, a clear policy is badly needed.

### **Trends**

For trout the trends are towards: (a) more smoked; (b) less fresh and gutted, and (c) bigger sizes.

Trout has changed from a luxury product priced far above salmon to an everyday meal.

Sports fisheries are still a growing market.

### **Perspectives**

The goal laid out in the Producers Code of Conduct sets a goal for all farmers:

*To produce the best, most healthy product possible, with the lowest impact on the environment possible, that is economically viable.*

Most fish farmers are in agreement with this objective and with the fact that transparency, animal welfare, close consumer contact and environment are issues that are essential on the agenda.

They want to be pro-active, they want to take part in constructive progress towards a modern industry in the positive sense, maybe that is the reason to call aquaculture a "young industry"?

## **A fresh view on freshwater fish like carp, eel and trout - Goodness and convenience from the neighbourhood**

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### **ABSTRACT**

Freshwater fish become more and more significant in the international fishmarket as marine resources decline as a result of fishing pressure. In Europe freshwater fish has a tired image mostly tied to a very conventional, traditional product range. The traditional product is live round fish dominated by carp, eel and trout. This boring situation can be changed taking initiatives from other overseas markets, which have had great success with freshwater species like catfish, hybrid striped bass or tilapia. The basic success of these species rests on availability and convenience; a message that can be translated for the common European products like carp, eel and trout into: Goodness and convenience from the neighbourhood.

The interest in European freshwater fish species is growing, even when the offered product forms remain very traditional and mostly uninspired. A look at the German situation is instructive.

### **Carp for Christmas, trout as a portion**

The German consumer enjoys carp mostly around Christmas. Since around 1000 BC, when the monks started carp farming in the southern parts of Germany, fish was consumed at Lent, as well as at Christmas and every Friday. The typical carp consumer has hardly changed. There are relatively distinct "carp-regions" in Germany, where carp is often eaten as blue-cooked whole fish. The consumer has to dig for the Y-shaped bones that sometimes stick in the mouth. So carp-lovers are mostly experienced, relatively old people who remember the good old times when this fish was a delicacy at Christmas. Frankonia is the major market for carp in Germany, also Saxony, where the major eastern production is located. Parts of the north like Hamburg (Schleswig-Holstein and Niedersachsen) also buy carp for Christmas. Apart from own production the fish is also imported, e.g., from Hungary. It comes mostly fresh slaughtered but if the consumer has bad luck, he can experience how his meal gives up its life in the fishshop. Carp can also come with a muddy taste when it has not been held long enough in clean freshwater tanks before Christmas.

The trout situation is hardly better. The market is dominated by cheap portion controlled trout that comes, like the carp, freshly slaughtered to the consumer. Rainbow trout of 150-200 g per fish to be boiled blue, grilled or smoked. The smoked trout market consists of whole fish or fillets. The only advantage compared to the carp is that the bones of the trout are easier to remove from the fish.

In the 1950s and 1960s trout was a very upmarket fish, but its reputation was spoiled by large scale producers chasing the best prices. However, live transport of trout is still going on in a big scale.

### **Eel - a fare for the old**

Eel has a bit different story to tell, even when it also comes from the farm like carp and trout. Also traditionally based on the elderly consumer today, like its two companions, it has a better reputation. The glass-eel (elvers) have to be caught and just fattened in the farm. For this reason and the overfished situation of glass-eel for farming, the price is still quite expensive. Eel is consumed mostly smoked but the offered quality range is very wide. From Baltic silver to New Zealand big, everything is possible. So the bad eel-experiences dominate the good ones.

The fresh eel-market is not a very important segment in Germany and most of the northern European countries. Spain loves the glass-eel itself as "fritura" and Holland offers some

paling (small smoked eels) whole as well as as fillets. The launch of smoked eel fillets made this fish interesting for the gastronomy and catering sectors, but eel is still a fatty product, not in line with the modern consumers lean approach to food.

### **The farm is no fishing boat**

If one looks at the marketing efforts put into freshwater fish species like carp, trout and eel, one will realise, that these products have been mostly sold in the fishmarket together with or substituting other fishery products. Everybody should know that a carp, eel or trout farm is not a fishing boat. Most of the farmers, who work on these species, avoid discussing their production methods or the origin of their fish and leave to the consumer, what he thinks about a farm full of fish.

Could you imagine if the same strategy would have been followed when it comes to other farmed animals? The trouble starts - as shown by the BSE-crisis - when lack of knowledge opens opportunities for doubt.

Farmed fish like carp, eel and trout are ultimately agricultural products, not fishery products. More carp farmers farm carp, trout and sometimes eel than fishermen do. We might then ask: Why give farmed species a fishery image? Why not tell the people about the trout in the ponds, surrounded by green meadows and flowers. A farm that everybody could visit, become acquainted with and learn to know. Carp harvesting is always a big feast in some parts of Germany, but the message of this delight is not spread. However, there are overseas examples that show quite impressively how a farm message can be used for positive marketing of freshwater species.

### **Catfish and cotton**

About 20 years ago in the southern United States there was a cotton crisis. The prices for cotton took a dive and the farmers in the Mississippi Delta, north of Jackson, suffered severe losses. The solution of their problems came in the sense of the word "out of the blue", when crossbreeding of the blue catfish and the channel catfish that live naturally in the bayous of the Mississippi river became the success story, changing the situation for the farmers to a multi-million business.

One could say that it was good luck that these farmers were no fishermen when they started to raise their catfish in clay ponds on their fields. They developed an industry orientated on the quality of the harvest, not on the quick money of the catch. The best natural ponds were dug in the Mississippi ground filled with well water and fine live fish were processed fresh in state of the art factories from the very beginning. Integrated farming from the egg to the fillet and feed made from own resources, which grow around the ponds, like soybean meal, maize, cottonseed and the community organization of the farms in associations were other steps which led to success.

In short: Today in Mississippi, Alabama and Louisiana about 300,000 t of channel catfish are produced per year and sold at optimal prices of about US\$ 4-6/kg. The most intelligent system these farmers developed was the marketing. This can be taken as an example for all freshwater efforts today but is not unique.

### **Farm-raised success**

The farmers founded the Catfish Institute that spread the message of the farm-raised catfish all over America. "Home on the farm" was the message given. The whole center of the marketing was the farmer. He was the good guy giving the best for the fish. Unlike other freshwater farming the fish never reaches the market alive. The major top product is the so called "shank-fillet", boneless, skinless, IQF fresh-frozen and convenient to the last bite. Even the name shows how much the farmers know about the market: They called their fillet after a chicken product, shank-fillet. Through intelligent marketing these farmers created a story of a

fish from the farm that is today used by all leading chefs of America. Today catfish from the South is third on the list of species consumed in the United States.

This example of catfish was transferred to a hybrid striped bass that also comes farm-raised and is the star among Asian food in America. The latest example of this good way of marketing is the increase of tilapia imports, coming mostly from Asian countries and Latin-America. All over the world this fish is sold strictly as coming from the farm. Some even emphasize that the pond quality is better controlled than a fishery situation ever can be.

Catfish farmers make all their production stages clear to the public. No hideaways, nothing untold - the farms can be visited as well as the production plants. Tilapia farmers even go further ahead, calling themselves, for example, "rainforest" - farmers, working in biologically clean and "bio"-situations. All the time the products are convenient, mostly frozen, boneless fillets, sometimes offered fresh. Round gutted fish of these species is rare and only segments of the market take them, such as "bloody-packs" of catfish for the markets of Chicago. No single consumer has to experience a whole fish on his plate or a ritual killing of the animal in front of him.

### **A fresh view on products**

To transfer this success to carp, trout and eel would need a fresh view of the production side. The best carp I ever experienced - to be frank - was enjoyed in a Chinese restaurant. The animal had been fried to a crispy fish that was served with sweet-sour-sauce. All the Y-bones were crispy, and could be eaten without problems, even the fins tasted like lovely crackers. This is not fare for everybody but an interesting approach to a new carp experience.

It is hard to understand why, in times when Asian kitchen delights are top in all culinary circles, nobody has come up with the idea to promote carp, the number one farmed fish in China. The cuisines of the world could develop recipes and carp products would be innovative and convenient. As practised in the Egli (the Swiss name for perch) product range which offers fillets in which the bones have been cut into tiny pieces by filleting, the same should happen in carp. An easily enjoyed carp fillet, fresh or even better frozen should be the basic offer to the modern consumer. This fillet should also be flavour-tested as in catfish farming. Every batch of harvested catfish is closely monitored for its taste and only fish classified as having no off-flavour go into production. There is no reason why the same could not be practised with carp and trout farming.

Big carp (over four years) could be used as portioned products. People are used to big fillets in a lot of markets and also to loins cut from big fillets. There is also a market for pre-marinated products, as the example in catfish shows. Why not marinate carp fillets in different ways, offered as MAP and as a chilled pre-prepared product?

### **Trout easy to consume**

There are even more possibilities for trout. The 150-200 g full-size fish of today should be mostly replaced with fillets of the same weight. This would lead to 500 g trout, a better tasting animal with a larger fillet, that could be offered frozen or fresh and bone-free. Bone-free means no bones, none at all! Such a carefully controlled fillet can be guaranteed to be really bone-free. Also marinated products could be marketed with loins or cuts from smoked trout. The trout should always be offered as fillets and not as a whole fish.

The best experiences have been with the so-called salmon trout, a big, partly sea-raised fish with red coloured meat. This product can approach the trout and can open the minds of the consumers to a variety of trout available. Why not brook-trout, steelhead, rainbow etc. as market names? Fried trout for the snack market, trout for sushi and sashimi, even trout off-cuts to put on sandwiches and pizzas - trout has the biggest variety in product possibilities that can be even copied from the product- or marketing-examples in poultry.



### **Upgrade the eel**

Frankly, I do not believe very much in an enlarged eel market. The basis of eel farming and therefore the basis of the product, glass-eel, becomes scarce and expensive, so that the community of eel farmers is more or less dependent on a critical situation. That should not hinder the eel producers from innovation in products and marketing. Eel is a too costly and potentially high quality product to be restricted to the traditional market for elderly people.

A good example is the eel fillet used in sushi-bars as one of the most expensive items. This fillet has been marinated and put on top of a rice ball. It is a very tasty product that offers value to the consumer. Eel could be developed to bigger sizes that give the possibility to offer larger fillets and fillet portions. There is a market for eel fillets fresh and frozen that should be developed and also furnished with upgraded recipes. The eel should come back to the white-cloth-restaurants and the star chefs should be encouraged to invent new ways of presenting eel to modern consumers.

Freshwater fish in general is a hot item when it comes to marketing. Reflecting on the success of pike-perch in the restaurants, based on constant delivery with boneless fresh and frozen fillets, there are good chances for carp, trout and eel, as well as for sturgeon or bass.

### **Bio or non-bio?**

The consumer of today has been alarmed by a lot of scandals when it comes to food processing. The BSE and FMD crisis showed this again. The "chain" of today is security and traceability of food products. That makes it easy for fish to convey this message to the public. Aquaculture technologies can stand comparison with all other food production operations in the world. There is nothing to hide. On the contrary there is much to tell about farming of fish that has nothing in common with mass rearing of warm-blooded animals. Fish allowed to form crowds in their pond express natural behaviour in their natural surroundings - the opposite of cows locked into dark stables, not allowed to move, or chicken squeezed into small cages.

Fish ponds are comparable to sheltered meadows where the green-hearted would like to see all cows grazing.

In common with trends for other foods there is currently a strident demand for "biologically correct" fish products, particularly farmed fish. Since "bio"-farmers earn good money certifying their products as ecological, the impetus was transferred to salmon, then to trout and now to shrimps. The major benefit has been to the profit of the certification bodies, which has often been earned without expertise. Trout farmers from Switzerland certify shrimp farms in Asia, small-scale salmon farmers set standards for farms with 2,000 t of production and more. It is as if Lada tells Mercedes Benz how to build cars - a sad reality.

One always sees that every declaration of bio products creates and compares a "good" product to one called bad and ugly. Where bio starts, when it comes to fishfarming, no one knows. Is it the bio of 1 000 BC when monks farmed carp only for their meals, is it the bio of the Genesis, when God created fish and separated the land from the sea or is it the bio of today's population, dependent on fish resources and growing by 500 million people every year? Aquaculture is one of the fastest growing food-production sectors with an annual growth rate since 1990 of 10 percent. About 40 million t of farmed aqua-product are on world markets. The absolute number one finfish are carp species.

Bio or non-bio-farmed freshwater fish is an important source of high quality valuable protein for the world. Farming and the marketing of farmed products can set the standards for the future - not more, not less. It needs more intelligence, more dignity, more ideas and innovation. It also needs less religion than expertise.

## New species potential: development of currently underproduced fish species

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### ABSTRACT

The number of cultured native fish species is relatively low in Europe. The success of some non-European species in their native area has inspired European fish culturists to introduce these fish into European waters, to increase the diversity of their products. Few of the introduced fish species have gained a significant role in European aquaculture. Since the dangers of the species-transfer between different habitats were recognized, the interest of aquaculturists was redirected toward the native fish fauna, and attempts were made to select species suitable for mass production.

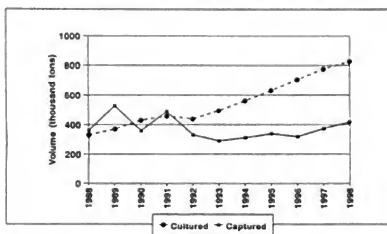
The development of fish rearing (and processing) technologies has opened new possibilities for production of native carnivorous fish, and for some earlier introduced species. The appearance of new goals in European fish culture, such as large-scale fish production for sport fishing, for stocking of natural/seminatural waters and production of fish for rehabilitation of the original fish fauna, have also directed interest to the native species.

However, the introduced species will remain a valuable part of the European fish fauna, and introduction of some new species for closed systems seems to be reasonable.

### The status of European finfish production

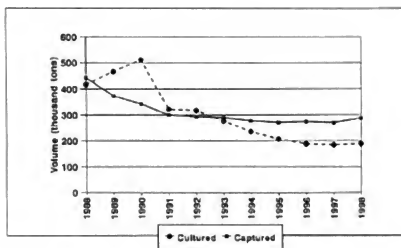
The contribution of Europe to world aquaculture production is relatively low (4.6 percent). The total production of freshwater finfish and diadromous fish was 1 718 781 t in 1998, of which 705 270 t was from capture fisheries, and 1 013 511 t was produced in aquaculture.

As shown in Figures 1 and 2, the production of cultured diadromous fish has increased by 148 percent during the period 1988-1998. The production of cultured freshwater fish has declined by 45 percent during the same period. The production of capture fisheries has declined in fresh waters, and the catch of diadromous fish is on the same level as a decade ago.



Data: FAO 2000

Figure 1. Production of cultured and captured diadromous fish species in Europe



Data: FAO 2000

**Figure 2.** Production of cultured and captured freshwater fish species in Europe

### The fish species

There are some 390-400 freshwater and diadromous fish species in Europe. Of these 51 freshwater and diadromous species were introduced from non-European areas. About 55-57 species have direct economic value. The number of fish species, which are specified individually in FAO statistics, is summarised in Table 1. The same table shows the number of native species (specified in the statistics) and the production of fish species, not specified in the statistics (expressed as a percentage of total production in 1998).

**Table 1**

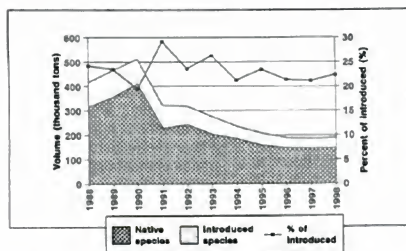
The number of species utilized by fish culture and by capture fisheries, and contribution of non-specified species to the total production of their group

	Cultured species		Captured species	
	Freshwater	Diadromous	Freshwater	Diadromous
Total number of species	24	13	27	31
Native species	11	~ 11	~ 19	~ 21
Production of non-specified species	6%	0,5%	1%	6%

The fish species with promising production potential should be in the group of fish utilized by capture fisheries, or in the group of low-production cultured fish. The reliable evaluation of species, which are not specified individually in statistics, is not possible, because of the uncertainties in reporting, mainly in the former USSR, and in some other Eastern European countries. However, there is very low probability that species suitable for mass pond- or industrial production could be selected from this group.

### The role of introduced freshwater species in aquaculture production

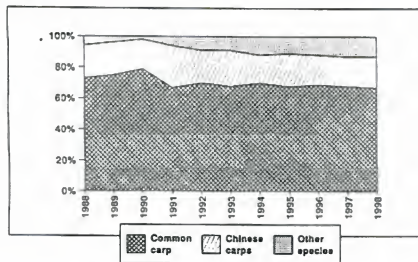
The contribution of introduced species to total European freshwater fish production is significant (Figure 3). About 20-25 percent of the total production of cultured fish is produced by rearing introduced species. (If the rainbow trout is considered an "introduced species" the ratio of this group is 35-40 percent.)



Data: FAO 2000

**Figure 3.** Production of cultured freshwater fish species in Europe

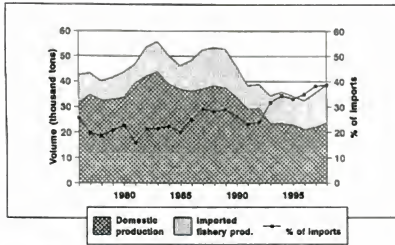
About 30 freshwater species were intentionally introduced to Europe for aquaculture purposes during the last century and a half. The most effective was the introduction of Chinese carps. The contribution of Chinese carps to the total pond fish production in Europe was 19-27 percent during the period 1988-1998 (Figure 4).



Data: FAO 2000

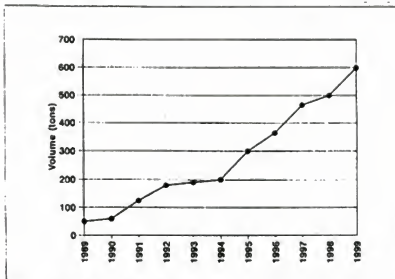
**Figure 4.** Contribution of common carp, Chinese carps and other species to European freshwater fish culture

The success of the introduction of a properly selected fish species is demonstrated in Figures 5 and 6. In a period when domestic production has declined in Hungary, as a consequence of the decreasing demand for carp species and increasing import, the growth of African catfish production has been exponential, because the market accepted the new species.



Data: Ministry of Agriculture

Figure 5. Domestic production and import of fish and fishery products in Hungary



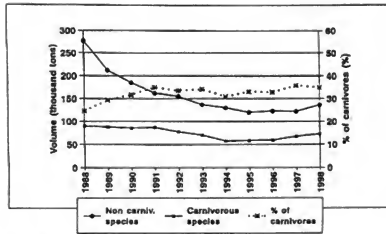
Data: Hungarian Fisheries Association

Figure 6. Production of cultured African catfish in Hungary

Based on the above examples (trout, Chinese carps, African catfish), we may conclude that the introduction of new species was an important and effective tool for aquaculture development for a long period. Of course, by introduction of new species, new technologies were also introduced. For example, polycultural pond fish production was started after the introduction of Chinese carps. Experience gained by introduction of Lena sturgeon (*Acipenser baeri*) was the basis of the further development of sturgeon culture in the area. However, the limited number of fish species suitable for introduction, and the intention to protect the local fauna/flora, directed the interest of fish culturists towards native species.

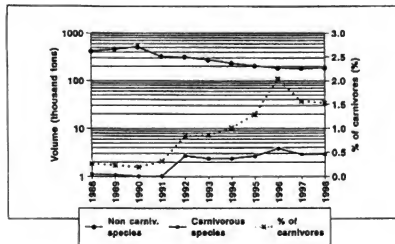
#### The role of native species in aquaculture development

As shown in Figure 1, the production of freshwater fish declined in Europe between 1988 and 1998. However, the tendency is different in the case of native carnivorous and predator fish, as can be seen in Figure 7 (capture fisheries) and Figure 8 (culture fisheries). Eel production has also increased during the same period, compensating for the decline of eel production from capture fisheries (Figure 9).



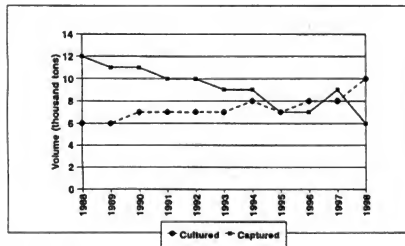
Data: FAO 2000 (volumes without species identification excluded)

Figure 7. Production of captured freshwater fish species in Europe



Data: FAO 2000 (volumes without species identification excluded)

Figure 8. Production of cultured carnivorous and non carnivorous freshwater fish species in Europe



Data: FAO 2000

Figure 9. Production of cultured and captured eel in Europe

However, the above data do not show that the general declining tendency of the total production (the consequence of worsening market acceptance of carp and the growing production of relatively cheap salmonids), has been followed by rising production of valuable freshwater carnivorous and predator fish species.

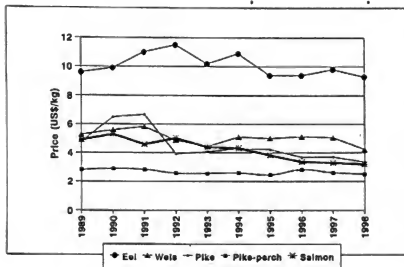
Growth in production of these species is the consequence of the increasing supply to farms of stocking material. With the exception of perch and eel there were no significant innovations in the production technologies of the majority of the species (pike perch, northern pike) during the last decade. Research on the biology of yellow perch accelerated the development of intensive production technology for European perch. The high price of glass eel and the excellent market acceptance of processed eel forced the researchers and producers to develop reliable technologies for eel production.

The further development of aquaculture production for these carnivorous/predator species is adversely influenced by competition with capture fisheries (Table 2). More than 95 percent of the total production of the valuable carnivorous fish are captured from natural waters (except for eel), and this relatively cheap source determines the price. The increasing availability and the decreasing price of processed salmon (Figure 10) also mitigate against the development and application of expensive rearing technologies for native carnivorous fish.

**Table 2**

The capture and culture fisheries production of some carnivorous fish species in Europe, in 1998

	Captured (t)	Cultured (t)	Cultured, as% of captured
European perch	27 650	191	<1
Northern pike	22 524	1 541	7
Pike perch	11 715	410	3
Wels	9 630	731	8
Eel	6 000	10 000	166



Data: FAO 2000

**Figure 10.** Prices of carnivorous fish species in Europe

### Selection of the “species of the future”

Extensive introduction of new species as the tool for fish production development was acceptable in the period when the main target of inland water fisheries and aquaculture production was to supply European consumers. However, the goals of freshwater fish production have changed/diversified in the recent past: in addition to food production, fish are produced in large quantities for recreational fisheries, and for rehabilitation or maintenance of fish populations in natural waters. The growing ornamental fish production (goldfish, koi and some native species) is a special segment of European aquaculture. Native species, or ornamental fish species introduced many decades ago, are mainly used to fulfil these new demands. However, production of certain introduced species will not decline significantly, while growth of production can be forecast in some cases (tilapia, African catfish, etc.).

### Fish for human consumption

#### Pond-raised fish

Though earlier levels of **common and Chinese carp** production will not be reached again in Europe, these species will be dominant in freshwater pond fish production in the next few decades. Medium scale trials in France and in Hungary on processing of common carp and the Chinese carps, indicated that these species can be processed easily, and the final products are palatable. However, the low percentage of dressing yield, and the cost of processing make the price of filleted/processed carp high. Based on market trials it can be supposed that a certain small consumer segment will accept processed carps.

However, further increase in the consumption of Cyprinidae, or introduction of new carp species to the European market is unlikely.

From the trends shown in Figures 7 and 8, the production of native predators and carnivorous freshwater pond fish (**pike, pike perch, perch and wels**) have scope for further development. Since the carp ponds are suitable for rearing these fish in biculture or in polyculture with carps, the growth of production depends mainly on seed supply. However, capture fisheries in natural waters/water reservoirs will also compete with pond production in the future. For further increase of the market acceptance of these fish filleting/processing is necessary, because the acceptance of the processed fish is much better.

The **Ictalurus species** are well established, and are well accepted by the market in many European countries. Further growth of the production can be expected in traditional and intensive ponds.

Successful trials have been undertaken with pond production of **paddlefish** in some countries in the last decades. Further efforts to produce these species on a wider scale seem to be reasonable. The paddlefish can be reared well in large size ponds and water reservoirs. However, this species is most probably a competitor of carps as it uses zooplankton as a feed source.

#### Fish for industrial systems

Medium-scale production of **tilapia** in heated recirculation systems, or in thermal effluents was started many years ago in Western Europe. Since this species is well accepted by the market in processed form, and the production method is relatively simple, further increases in production, up to few thousand tons, can be expected. Large-scale tilapia production will be started in the near future in some farms of Central Eastern Europe by Hungarian and Israeli investors.

The industrialized production technology of **wels** was developed during the 1980s, and has been introduced on a large scale during the last decade. The species is excellent for intensive culture, and market acceptance is good. There are no constraints to further increase production.



Production of **European perch**, in cages and closed systems, has started recently. If intensive production is combined with processing, the product can compete with perch from capture fisheries in a certain segment of the market.

There have been no successful (medium- or large-scale) trials on production of **pike perch** in closed systems, although a programme was recently started for the development of pellet based rearing technology.

Two species have gained worldwide attention regarding their possible introduction into intensive/industrial production: The South American *Pseudoplatystoma fasciatum*, and the Chinese *Siniperca chuatsi*. Production of these species is fast-growing in their native area and investigation of the possible application, in industrial systems in Europe, may deserve some attention.

### **Sport-fish production/culture based fisheries**

Many water bodies in Europe are used for both recreational and commercial fisheries. In addition to fish for catching, young fish are stocked into these waters to maintain the biodiversity and the semi-natural conditions of the waters. In Hungary, for example, about 100 nursed predator fry are stocked per hectare of water surface of natural waters used by anglers and fisheries associations. Additionally other fish, such as wild varieties of carp, Chinese carps and different breams are frequently stocked. The quantity of the stocked population should be enough for production of 30-200 kg fish/ha.

However, the majority of the fish species used for restocking are not suitable for artificial reproduction, or their induced breeding is difficult, (**roach**s, **rudds**, **gobies**, etc.), because the size of the fish is small, or their ovulation is not synchronized. Therefore establishment or reconstruction of spawning grounds is necessary to support the semi-natural spawning of these species.

Artificial seed production technology for larger species, as **sterlet**, **barbus species**, **asp**, **orf**, **burbot** has been developed, and the fry/fingerlings of these species can be produced in fish farms for stocking.

The **largemouth bass** is an excellent sport fish but improvement of semi-natural breeding is necessary to produce more fry for extensive stocking.

### **Fish production for rehabilitation of natural fish fauna**

Water pollution, destruction of spawning grounds and introduction of competitor species endanger the survival of many native species. Some of these species can be protected only by full rehabilitation of their habitats. Other species are suitable for large-scale artificial breeding. Development of the proper seed production technology may help to re-establish or maintain the population of these fish species. For example, a programme was started in Hungary for rehabilitation of the fish population of the Tisza river, after cyanide pollution. Nursed fry of a wild variety of carp and fry of different carnivorous species were stocked on a large scale in the river. Additionally, a research programme was started to develop large-scale fry production technology for two extremely endangered species (*Zingel zingel* and *Gymnocephalus schraetzer*).

### **Ornamental fish production**

Asian ornamental fish producers are the main suppliers of the Western European market, although European production of cold-water ornamental fish (goldfish and koi carp) has increasing significance. Many ponds, which were used earlier for carp production, are being converted for goldfish and koi rearing. Goldfish and koi production is also growing in Central Eastern Europe. Further development of the European ornamental fish production can be expected in the near future to supply the traditional (Western European), and the growing Eastern European markets.

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## The catfish industry in the United States

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### ABSTRACT

A review of the success of catfish farming in the south of the United States, which has largely been based on the vertical integration of all production and marketing operations under the aegis of the Catfish Institute (TCI), funded by a levy on feed mill production of catfish feed.

### What? Where?

The dictionary defines aquaculture as the science of raising water-based animals in a controlled environment. One of the main differences between farm-raised and wild catfish is their living conditions. Farm-raised catfish are raised in a quality-controlled environment of clay-based ponds filled with pure fresh water pumped from underground wells. The rectangular-shaped ponds, averaging 5 –10 hectares each, are built above ground from the rich southern soil by constructing levees, or embankments, that are then filled with one and a half to two meters of water.

Another notable distinction between farm-raised and wild catfish is what - and how- they eat. Farm-raised catfish are fed a "gourmet diet" of puffed, high-protein food pellets that give them a mild, almost sweet taste. And because the food pellets float, farm-raised catfish feed at the top of the water, unlike wild catfish which eat at the bottom.

Why stress the differences between wild and farm-raised fish ?

Because this is simply not the same product. And farmers are not fishermen...

The success of a product is very much dependent on the consumer's knowledge of that particular product (or/and profession). The more the knowledge is incomplete, the more the consumer is reluctant to innovate.

Transparency in the production process is a good start in the communication strategy.

Producing catfish in nature is a team effort. After the female lays the eggs, the male guards them until they hatch. In order to replicate the natural fanning motion made by the male catfish's tail, farm-raised catfish producers place rotating metal blades in each hatchery bin to provide oxygen to the developing eggs.

After 18 months or when the fish reach about 650 g each, they are harvested with seines and loading baskets, then taken alive to processing plants in aerated tank trucks. Once they reach the plants, the whole production process takes less than 30 minutes, making genuine US farm-raised catfish among the freshest fish available.

Catfish farming developed in the Mid-South in a region with a climate favorable to the agricultural community because of its great economic significance and low population/rural setting.

Moreover, catfish expansion is related to crop price! Production of most of the region's agronomic crops -- cotton, rice, soybeans -- are generally unprofitable. That is why people have turned to catfish production, which is indeed more profitable. Low cost of production is also one of the key success factors of the catfish industry.

About 95 percent of the nation's farm-raised catfish are raised in the Mississippi, Arkansas, Alabama and Louisiana regions. The catfish ponds cover approximately 85 000 hectares. More farm-raised catfish is produced and sold in these states than all other United States aquaculture species combined.

During the year 2000, the production of catfish was 280 000 t from more than 1,300 farmers, and US\$ 700 million worth were sold.

The three main markets for catfish are:

- The domestic market
- Canada (172 t compared to 232 t to all other countries combined)
- Germany

Even if the United States is the biggest catfish producer in the world, the demand for this product is increasing and imports are becoming more important. In 2000 Vietnam accounted for 91 percent of all catfish imports, with the remainder coming from Guyana and Thailand.

### **Environment and quality control**

No human activity is without impact on the environment. The important consideration is not, therefore, whether an impact exists, but whether that impact can be tolerated relative to the benefits of the activity in question.

The catfish industry -- farmers in particular -- pay great attention to the environmental issues of their activity.

Catfish pond effluents are one of the biggest concerns of the industry and permanent analysis and studies are conducted to meet the environmental requirements and to improve the quality of these effluents. Furthermore, water management practices are such that water is discharged from catfish farms during the winter and spring periods of high precipitation, when effluent water quality is at its seasonal best and any water discharged is greatly diluted by high flows.

Finally, and to limit the risk of a too important and unregulated extension of catfish ponds, the US Environmental Protection Agency (USEPA) is conducting research to prepare proposed guidelines by 2002 and final guidelines by 2004. Some of the conclusions could be the issuing of permits and the establishment of taxes for farmers, as regards effluents.

Apart from the environmental conditions of production, a quality control programme has been developed in order to ensure the best product to the consumer. In 1987, The Catfish Institute (TCI) became the first association in the seafood industry to pioneer a quality control programme when it contracted with the US Department of Commerce (USDC) to conduct weekly inspections of farm-raised catfish processing plants.

Catfish must pass severe taste tests at the ponds where they are raised and undergo USDC inspection at the processing plant before they can be listed as "Certified Processors", confirming that the processors who have packed the catfish have met the highest standards set by TCI.

This quality control programme preceded the Food and Drug Administration (FDA) mandatory regulatory system for the seafood industry called Hazard Analysis Critical Control Points (HACCP), which was instituted in 1997 to prevent food safety problems before they occur.

Long term scientific studies have also eliminated some "bad" catfish characteristics such as off-flavor.

Sometimes, harvesting and transportation of live fish to processing plants, or other ponds can be a fish health problem, mainly due to the stress of the fish. Therefore, the industry is developing a multi-state project to ensure more efficient, less stressful harvesting and transportation systems for live fish, so the consumer will have the best possible finished product.

### A marketing success story

Based in Belzoni, Mississippi, The Catfish Institute is an association of catfish farmers, processors and feed manufacturers, founded in 1986 to "raise awareness of the positive qualities of US farm-raised catfish". TCI has also worked with an advertising agency in order to professionalize its marketing programme.

Since TCI's formation, annual (live weight) catfish sales have grown from 90 000 t to over 300 000 t in 2000.

United States *per capita* consumption has more than doubled and is permanently growing. Catfish is the number one farmed finfish and the fifth most popular fish among American consumers, restaurants and foodservices institutions.

Apart from the beginning, when the farmers requested scientific and technical support from the government, the catfish industry has provided almost all the money necessary to achieve its marketing and promotional strategy. This important financial commitment is very well compensated by the return on investment ratio, which characterizes that particular type of niche.

Since 1986, TCI has raised nearly US\$ 29 million through a levy on members' feed mill dues to fund advertising, public relations, food service campaigns and export promotions designed to attract potential customers/consumers.

TCI has created and disseminated effective and truthful marketing messages about a formally misunderstood food source. In fact, while trend-setters have certainly helped to change the "poor country cousin" image of catfish, the biggest contributor to the catfish industry is The Catfish Institute.

TCI is a relatively well-organized association which combines the interests of almost all the catfish related industry. That is why from the farmer to the consumer, there is one strategy and only one. The message is always based on a "sophisticated" product and not the price. Quality of the product as well as its versatility ("you don't have to fry it to love it") are the main features of the catfish developed in the major advertising campaigns.

But instead of focusing only on the product (which has to be perfect), the catfish industry has moved into a "market"-oriented approach to business. In other words, by anticipating (and knowing) the market, you better respond to it, and even create the need for consumption. From a promotional point of view, the message to consumers is then very precise and accurate.

Furthermore, the marketing channel, depending on the final product concerned, can be very direct: the budget is spent on the ultimate consumer. In other words, the producers pull their products through the stores and do not rely on the retailers for their success.

*"Buyers and merchandise managers are pretty much forced by consumers to carry our products. If they don't find our catfish in their store or channel of distribution, consumers simply buy them elsewhere"* some farmers say.

*"The retailers are the main obstacle to our business added-value; you must compete with them to maintain your margin"* others say.

The best practice, however, is to be fully integrated in order to be profitable.

To summarize, over many years The Catfish Institute has created a real "Catfish Community":

- Trade shows,
- Partnership with world-class chefs,

- Creation of recipe guides with preparation ranging from "quick and easy" and "Meals in minutes" to regional favorites and international creations,
- Organization of "Miss Catfish" election,
- Edition of catfish newspapers,

All these communication tools have enabled people to be part of a group, not only a consumer group, but a group where famous writers, world-class chefs and biologists are the driving force, and where the workers have a greater economic impact according to regions.

The catfish industry has made a tremendous economic impact in Alabama, Arkansas, Louisiana and Mississippi. In 1985, the catfish industry in these four states employed approximately 6,000 people and contributed US\$ 2.1 billion to the individual states' economies. Nowadays, it employs more than 13,000 people for an economic contribution of US\$ 4 billion to the states economies.

### **Economic prospectives**

Overfishing, extinction of certain species and reduction of quotas are factors that will positively influence aquaculture in general and the catfish industry in particular.

Not all species can be farm-raised but extensive research can accelerate the chance for aquaculture to be a real substitute to decreasing natural seafood.

The US Department of Agriculture (USDA) predicts that by the year 2025, the available supply of seafood will be far less than consumer demand. United States farm-raised catfish provides a solution to this nationwide problem because it is available all year round at an affordable price.

While seafood from aquaculture today represents 15 percent of total seafood consumption in the United States, this percentage is expected to double within the next 10 years. According to a report published by the Consultative Group on International Research (CGIAR), fish farming could provide nearly 40 percent of all food fish within the next 15 years.

Then farmers should take the opportunity to develop new species that will diversify the offer to consumers, and potentially open new markets.

Furthermore, while most of America's seafood is being imported, the consistent and abundant supply of catfish makes exporting possible (Canada and Germany are already two important emerging markets). Moreover, the expectation of a relatively strong domestic economy, and continued growth in Asia will boost trade opportunities.

As the leader of the aquaculture industry (not only because of its size but because of the high quality of its products and above all because of its very efficient marketing strategy), United States farm-raised catfish could serve as a role model for others and will help ensure adequate seafood supplies in the future.

## The influence of environmental policies on aquaculture development

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### ABSTRACT

Examples of the impact of environmental policies on aquaculture development in Denmark, France and Germany. The need for common legislation and coherent development policies for aquaculture in all countries is stressed, together with a need for improvement of feed efficiency and effluent treatment.

### Context

Aquaculture in Europe covers a wide field from traditional carp and trout farming in earthen ponds to recirculation units and cage culture. Some farming systems have been established for more than 100 years whereas fish farming in cages and fish farming in recirculation units are comparatively young industries.

Aquaculture very often creates multi-user conflicts, especially in cases when a farmer applies for a new licence or a renewal of a licence. Landscape and water are limited resources. Therefore several interests that vary regionally have to be taken into account.

This paper gives examples of environmental policy and its influence on aquaculture development in France, Germany and Denmark.

The information presented is mainly concentrated on trout farming in fresh water. However, problems concerning environmental issues are similar for all cultivated freshwater species.

### Definition of aquaculture development

Aquaculture development may be defined by one, or a combination, of the following points:

- increase of production;
- new production sites;
- new techniques for rearing;
- optimisation of the rearing environment, e.g., continuous control and regulation of vital parameters such as oxygen content, flow, rate of the water;
- feeding according to the requirements of the fish;
- development/optimisation of diets according to the nutritional requirements of the fish;
- installation of treatments for effluents, and
- new species.

### Environmental concerns in relation to aquaculture

Areas of environmental concern in relation to aquaculture could be listed as:

- creation/removal of migratory barriers for wild fish and other creatures (in relation to EC fish health regulations);
- addition of nutrients to the water body;
- land use;
- minimum flow to remain in the natural watercourse;

- use of energy and water;
- predator control;
- population genetics of wild stocks, and
- use of disinfectants and therapeutics.

The content of nutrients in fish farm effluents is in general considered to be the main environmental impact of aquaculture.

Environmental legislation applicable to aquaculture may cover all the topics mentioned above or only some of them. Politics provides the framework for the development and continuation of the aquaculture industry. Within Europe the legislative framework clearly differs between states or regions.

### **Environmental policies**

The examples presented below have been chosen to show the way environmental policies may influence aquaculture development.

#### **➤ Denmark**

At the end of the 1980s strict rules to minimize and to reduce the effluent load from aquaculture were set. These included a combination of feed quotas per farm, rules for the diets used and limits for maximum nutrient concentrations in the effluent.

The regulations resulted in stagnation of production, as the feed quotas determined maximum production per site. Furthermore the regulations led to stagnation in the development of new or improved rearing techniques, as in most cases the effluent levels set could be met with traditional techniques.

A positive side effect of these regulations has been increased research into more efficient and therefore also more environmentally-friendly diets. Today for economic reasons such environmentally-friendly diets are being used in all trout farms in Central Europe.

In the future the feed quota system in Denmark might be modified.

#### **➤ France**

In 1998 a system was implemented setting fees per unit of nutrient added to the water by the fish farm. The calculation is based on the annual amount of feed used. The farmer has the option to reduce the annual fee by using better, e.g., high-energy diets and/or the installation of a microfilter in order to reduce the effluent load. Maximum annual levels of feed consumption are fixed. Small farms are exempt from the scheme. The annual fees are moderate. A four-year adaptation period was started in 1998, with final values to be fixed in 2001.

In addition, financial assistance is available for the installation of effluent treatment systems like microfilters.

#### **➤ Germany**

In Germany, local authorities grant licenses for aquaculture facilities. Their decisions are based on general federal laws and accord with political views, which may differ considerably between the Länder (states of the federation). Federal law concerning use of water and water pollution does not specifically include rules for the new development and operation of fish farms. This provides opportunities for legal interpretations. Attempts by a working group to establish general and very strict rules concerning the effluent quality of fish farms have so far failed. As a result, in some states fish farms are charged for discharge, whereas similar fish farms in other states are not.



The interest in removal of migratory barriers for fish in rivers gains increasing importance. This is a possible field of conflict with the EU fish health directives 91/67 EEC and 93/53 EEC, requesting migration barriers for fish between zones of different health status.

Discussion about minimum flow rates to remain in the river passing an aquaculture facility is increasing between fish farmers and the water authorities.

As the regulatory framework and technical support clearly differs between regions, trout production varies between states in Germany. Nationally, trout production remained stable during the last decade. However, in a few Lander, especially Baden-Wuerttemberg and Bavaria, trout production increased annually, whereas in Northern and Eastern Germany trout production decreased. Baden-Wuerttemberg, with the most significant increase in trout production, has the most modern trout farms. These farms also produce in the most environmentally-efficient way.

#### **Environmental load from trout farming**

The addition of nutrients to the water body from an aquaculture operation is considered the main environmental impact of aquaculture. This point will be described in more detail.

Trout are fed on compound diets originating from outside sources. This distinguishes trout farming from carp farming, where at least some part of the feed is produced through natural processes within a carp pond. Most of the feed given to the fish is transformed into growth. However, undigested food and residues from metabolism are released into the water. These are nutrients and organic load. The effluent load varies depending on several factors. The most important are fish size, feeding ration, quality and energy content of the diet as well as rearing conditions.

The average effluent load (relative load/t trout produced) from trout farming decreased in recent years to less than 20 percent of the values in the 1970s (Table 1). These reductions are based mainly on the use of diets, which are of high nutritional value and are especially adapted to the nutritional requirements of the fish. Another important factor is the optimisation of the rearing conditions for the fish. It is particularly important to ensure oxygen content of permanently more than 6 mg/l. This enables effective utilization of the high-energy diets used in trout culture today.

**Table 1**

Average effluent load (kg/ t rainbow trout produced)

<b>Average load</b>	<b>1970s</b>	<b>End of 1990s</b>
Kg N/t production	180	30
Kg P/t production	30	5

In addition, during the last decade methods to remove particles from fish farm effluents have been developed and implemented in practical fish farming. Mechanical treatment is done by filtering, using mesh sizes of 60-100 µm (microfilter) or by sedimentation ponds with periodic removal of the sediments. By such treatments it is possible to reduce the environmental load from trout farming very effectively. Actual values of the removal efficiency by the installation of a microfilter (mesh size 60-100 µm) for trout farm effluents are given in Table 2.

**Table 2**

Efficiency (range) of the mechanical treatment (microfilter) of fish farm effluents

<b>Parameter</b>	<b>Removal efficiency Range (Percent of content)</b>
particles	50-95
BOD <sub>5</sub>	0-20
Total-P	30-60
Total-N	0-25

The massive reduction of nutrient emissions was achieved not only in response to legal requirements, but also for economic reasons. The intensive competition within the European Union required the aquaculture industry to improve its efficiency. The economic requirements led to the use of high quality feed and improved aeration or oxygenation, which also resulted in a very much-reduced environmental impact per ton of fish produced.

Meanwhile in Central Europe starting a trout farm at a new site has become very difficult due to environmental legislation.

#### **Main findings/conclusions**

Aquaculture development is influenced directly by environmental policies. As shown above reduction of fish farm effluents and aquaculture development are most effective in cases, when environmental legislation does not try to directly control the running of aquaculture sites, but sets limits only for effluent loads.

Such regulations ensure that the farmer remains responsible for the running of his farm. He has the economic interest in investment into measurements to reduce the environmental load of the farm, and will be able to improve his production methods within the set limits.

Any environmental policy, which reduces or removes the initiative of the individual farmer, does not have the potential for effective reduction of the environmental impact. In the best case, environmental impact remains at the present level. Amelioration may not be expected, as there is no commercial interest.

Environmental policy concerning aquaculture also has positive side effects, as the example from Denmark has shown. It led to the development of more effective and thus more environmentally-friendly diets, which are now used in the whole of Europe, independent from the actual environmental policy. However, this was possible because only the framework of the diet to be used had been set. The actual state of the art had not been fixed.

Another efficient way to reduce environmental impact is a combination of regulations and financial support and/or a reduction of fees, providing certain measures are undertaken. This has been demonstrated in France where only a few farmers have to pay fees, but many have invested in effluent treatment.

#### **Recommendations**

Aquaculture in Europe operates within a very large common market, which is likely to expand to the states of Eastern Europe in the near future. Therefore, it is important to have common legislation to set the framework between aquaculture and the environment. Only with an environmental policy, which is similar for all countries, will the economic framework for aquaculture be comparable.

On the other hand, environmental policies should accept aquaculture as part of agriculture. However, in general the fish farmer should remain responsible for the minimization of the effluent load.

Overall the industry relies upon, and requests, a clean and suitable supply of fresh water as a basis for production. Therefore it is commonly agreed that the industry cannot be indifferent to its environmental impact.

There is scope for further improvements:

- Feed efficiency, even though in many respects already better in aquaculture than in many other forms of farming, has potential for further improvement. This means there is scope to retain more feed in the fish and in consequence release fewer waste products to the environment.
- Techniques for effluent treatment should become more widely used. Existing techniques are expensive and therefore only larger farms use them. There is scope for new techniques with less energy consumption and better cleaning efficiency.
- EC-Fish health regulations, and therefore barriers protecting fish farms from migratory fish, have an immediate importance for fish welfare and the economic viability of aquaculture. After freedom from serious fish diseases has been established within a zone, barriers can be removed for the benefit of migratory aquatic organisms.

In general, environmental policies, which set only the framework for aquaculture, are more efficient in protecting the environment than those which regulate every aspect of fish farm operations. In the latter case, the farmer has no interest in investing in further techniques to reduce the load from his operation.

## Development of policies, best practices and standards for hygiene and human health - impact on production for European freshwater aquaculture

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It is useful to emphasise the point that aquaculture is about producing food. This is sometimes forgotten in all the debates on aquaculture development, where the environment and the social context sometimes seem to dominate discussions. Of course they are important issues. But the bottom line is that the fish will be harvested and sold for food in the vast majority of cases.

Another obvious statement is that all aquaculture companies should be producing safe food. Of course, production must be done in an profitable manner and it must not harm the environment, but the bottom line is that consumers do not want to be eating food that is going to make them sick, either in the short term or the long term. Unfortunately, at the moment many consumers are insecure about this and the food industry (and European inland aquaculture is part of the food industry) has a long way to climb to regain consumer confidence.

Food safety has become a highly visible and political issue in recent years and many national and international bodies are making significant efforts towards improving the safety of foods.

In the European context, obviously the European Union (and the European Commission) is playing a significant role. Recently, the European Commissioners David Byrne, for Health and Consumer Protection, and Franz Fischler, for Agriculture, Rural Development and Fisheries, launched a debate on food quality, safety and production (Box 1).

The Director General of the World Health Organisation has also placed food safety on top of her agenda (Box 2) focusing, in part, on the European situation, where she has some fairly challenging statements about the European situation. Aquaculture has been making the food safety headlines as well as agriculture, and the consumer does not distinguish between aquaculture of various species. So if it is bad news making the papers for salmon then that will affect all aquaculture.

### Box 1

Brussels, 5 March 2001

#### Fischler and Byrne launch broad debate on food quality, safety and production

(extracted from DG Health and Consumer Protection website)

*Today at a high level round table with leading food producers, retailers, consumer experts and scientists, Commissioners David Byrne for Health and Consumer Protection and Franz Fischler for Agriculture, Rural Development and Fisheries launched a debate for a strategic re-thinking of food production and food policy in terms of quality, safety and cost. The Commissioners emphasised the need for shifts in attitudes of both consumers and producers if initiatives to improve the overall quality of the food on offer are to succeed. The challenge is to find ways to match consumer demands and expectations for good quality food with a corresponding food supply. Based on ideas emerging from today's round table the Commissioners suggested concrete follow up-actions, such as similar round tables in the Member States and collect suggestions for common policies or a conference with the European Parliament to consider the role of public policy vis a vis food quality and production methods.*

*"Consumers nowadays expect their food to be safe, wholesome, and tasty. As policy makers, we are seeking ways to push quality up the agenda in dialogue with consumers and stakeholders. We are focusing on how to develop the trend towards quality and diversity. I want to see a quality driven single market in foodstuffs," David Byrne said explaining the initiative.*

*"Modern production methods must put consumers first and there has been a fundamental change in the job agriculture is expected to do. Responsible agriculture must be viable yet sustainable – economically, environmentally and socially. We must work more and more with nature and not against it. It is my intention to listen to society in shaping the future common agricultural policy," Franz Fischler stated.*

Other initiatives in Europe include the setting up of specialist food safety authorities in various countries. These include the Food Standards Agency in the UK, the Food Safety Authority of Ireland and the establishment in Europe of the European Food Safety Authority under the auspices of the EU.

Food safety is a “gate to plate”, “boat to throat”, “farm to table” issue. Therefore we cannot really separate the production and utilisation issues, as farmed fish is the raw material for the final product. However, aquaculture does have some special considerations when compared to wild fish, but also has several opportunities. The special aquaculture issues relating to safe food pose two questions:

1. What are the policies, best practices and standards to ensure hygiene and human health in farmed fish production?
2. What is the impact on production of the food safety imperative?

#### **Policies, best practices and standards**

Speaking in the European context: what does the European fish farmer have to know and do with regard to ensuring that his/her products are safe to eat?

First and foremost is the need to adhere to the plethora of rules on this issue. Over the years these “rules” have changed. Brundtland (2001) nicely summarises this evolution in Europe into 3 “waves”

- Between the 1950s and 1980s - the “first wave” of food safety measures came with the pasteurisation of milk and milk products and the introduction of rigid and effective hygiene systems in the production chain
- The “second wave” of food safety measures came with the widespread introduction of HACCP; the hazard control system for the production chain.

But the agenda is now moving on towards what Brundtland calls the third wave:

- The third wave must focus on the direct risk to humans.

Why is this “third wave” necessary? Well, basically “*we are seeing increasing reports of food-borne diseases, resulting from chemical or pathogenic contamination. This situation, and associated loss of public confidence, suggest that something has gone wrong. We need a “third wave” of food safety measures.*” (Brundtland, 2001).

However, before going into the details of this risk analysis approach, I will focus on where we are now.

The main laws of the European Union are the Council Directive 91/493 (fish and fish products) and 91/492 (live bivalves). This legislation is focused on ensuring the safety of fish being placed on the European Union market for human consumption. There are also related legislation that affects placing fish on the market of the EU. A selection of some of the more important ones are listed in Table 1, though some are irrelevant to aquaculture. These cover fish and fish products, aquaculture animals and products and live molluscs.

#### **Box 2**

**Dr Gro Harlem Brundtland**  
**Director-General, World Health Organization**  
**Uppsala, Sweden, 14 March 2001**

#### **Food Chain 2001 - “Food Safety - a World-wide Challenge”**

(extracted from WHO website)

*Ten years ago, food safety was not on many people’s mind in Europe. We all expected our food to be safe, not only because it generally was safe, but also because incidences of chemical or microbiological contamination were local in nature. So was the reporting about them. A conference like this one would not generate much interest beyond the people present.*

*What a contrast with the present. Today, food safety is one of the highest priority issues for consumers, producers and governments alike, all over Europe.....*

*.....we need to accept that the systems we use in Europe to ensure food safety are not as good as we have come to believe. To improve these systems and re-establish consumer confidence, we must reassess them all the way from the farm to the table.....*

**Table 1**Relevant European Commission legislation (*Taken directly from the Europa website*)

Legislation			Covering
Directive	91/492/EEC	Official Journal L268/1, 24/9/91	Live bivalve molluscs
Directive	91/493/EEC	L 268/15, 24/9/91	Fishery products
Directive	95/71/EEC	L 332/40, 31/12/95	Modifies Directive 91/493/EEC
Directive	92/48/EEC	L 187/41, 7/7/92	Fishing vessels – Freezer vessels
Decision	93/25/EEC	L 16/22, 25/1/93	Heat Treatment – bivalve molluscs and gastropods
Decision	93/51/EEC	L 13/11, 21/1/93	Microbiological criteria – Crustaceans and shellfish
Decision	93/140/EEC	L 56/42, 9/3/93	Parasites
Decision	93/351/EEC	L 144/23, 16/6/93	Mercury
Decision	93/383/EEC	L 166/31, 8/7/93	Biotoxins – Laboratory
Decision	94/356/EC	L 156/50, 23/6/94	HACCP
Decision	95/149/EC	L 97/84/EC, 29/4/95	TVBN
Decision	95/328/EC	L 191/32, 12/8/95	Health certificates – Fishery Products
Decision	96/333/EC	L 127/33, 25/5/96	Health certificate – Live bivalve molluscs
Decision	96/340/EC	L 129/35, 30/5/96	Snails and frog legs
Decision	97/20/EC	L 277/42, 14/10/97	Third Countries – List for bivalve molluscs
Decision	97/296/EC	L 122/21, 14/5/97	Third countries – List for fishery products
Decision	2001/255/EC	L 91/89, 31/5/2001	Amends Decision 97/20
Decision	2001/111/EC	L 42/6, 13/2/2001	Amends Decision 97/296

Legislation	Covering
<b>Complementary texts</b>	
Regulation (EC)2406/96 L 334/1, 23/12/96	Organoleptic criteria
Regulation (EC)1093/94 L 121/3, 12/5/84	Direct landing (third countries)
Directive 98/83/EC L 330/32, 5/12/98	Potable water
Directive 88/320/EEC L 143/35, 11/6/88	Good laboratory practices
Directive 95/2/EC L 61/1, 18/3/95	Food additives

There is also currently a proposal for a regulation of the European Parliament and of the Council on the hygiene of foodstuffs that will consolidate a lot of the legislation on hygiene of foods. Currently there are 17 Directives that have been gradually developed since 1964 in response to the needs of the internal market. These have covered hygiene, animal health, official controls and the existence of different hygiene regimes for products of animal origin and other food have led to a complex situation. The plan is to separate aspects of food hygiene from animal health and official control issues.

Clearly not all European inland aquaculture production is in the EU and not all production is destined for the EU market. However, the 12 accession countries (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia) are currently "harmonising" their legislation to align it with "*Aquis communautaire*", a prerequisite for membership to the club. Turkey is also in discussions with the European Commission. Within the European context, this leaves the European CIS states and some of the Balkan states outside of the framework - currently. So it is not unrealistic to talk of Europe, from the food safety perspective, as playing on the same field. Thus the European Commission legislation is affecting everyone.

EC legislation is, in fact, based on the *Codex Alimentarius* Codes of Practice. The Codex system is a joint initiative between FAO and WHO first started in 1961. It is described in detail on the Codex website (<http://www.codexalimentarius.net/>), but in summary, the *Codex Alimentarius Commission* produces internationally agreed standards and guidelines across the whole food sector. This includes a group on fish and fish products, but also includes horizontal guidelines spanning the food sectors, for instance on food hygiene (covering HACCP), labelling, export certification systems, etc.

It would be remiss, as an FAO employee, not to also mention the important contribution that the Code of Conduct for Responsible Fisheries is playing across the whole fisheries sector (including aquaculture). Specifically on the food safety side, I have included a box (Box 3) which, for reference, shows the articles that refer to this issue. The FAO Fisheries Department produces guidelines on how to implement the Code of Conduct.

Lastly, I must not forget the customer and ultimately the consumer. The customer will often be stricter than legislative requirements with wider reaching and more exacting standards. The bigger supermarkets, for instance, will regularly visit suppliers to ensure quality requirements are met, and will cease trading with any supplier that does not meet their standards.

Of course, it is ultimately the consumer that is forcing this drive for improved safety and quality. Today's consumer, especially in the industrialised countries, is a very discerning

## Box 3

**Code of Conduct for Responsible Fisheries - articles relating to food safety****9.4 Responsible aquaculture at the production level**

9.4.4 States should promote effective farm and fish health management practices favouring hygienic measures and vaccines. Safe, effective and minimal use of therapeutants, hormones and drugs, antibiotics and other disease control chemicals should be ensured.

9.4.5 States should regulate the use of chemical inputs in aquaculture which are hazardous to human health and the environment.

9.4.6 States should require that the disposal of wastes such as offal, sludge, dead or diseased fish, excess veterinary drugs and other hazardous chemical inputs does not constitute a hazard to human health and the environment.

9.4.7 States should ensure the food safety of aquaculture products and promote efforts which maintain product quality and improve their value through particular care before and during harvesting and on-site processing and in storage and transport of the products.

**11.1 Responsible fish utilisation**

11.1.1 States should adopt appropriate measures to ensure the right of consumers to safe, wholesome and unadulterated fish and fishery products.

11.1.2 States should establish and maintain effective national safety and quality assurance systems to protect consumer health and prevent commercial fraud.

11.1.3 States should set minimum standards for safety and quality assurance and make sure that these standards are effectively applied throughout the industry. They should promote the implementation of quality standards agreed within the context of the FAO/WHO Codex Alimentarius Commission and other relevant organizations or arrangements.

11.1.4 States should cooperate to achieve harmonization, or mutual recognition, or both, of national sanitary measures and certification programmes as appropriate and explore possibilities for the establishment of mutually recognized control and certification agencies.

11.1.6 States and relevant organizations should sponsor research in fish technology and quality assurance and support projects to improve post-harvest handling of fish, taking into account the economic, social, environmental and nutritional impact of such projects.

buyer, and is expecting higher and higher standards and a wider choice. This presents challenges to the aquaculture sector in Europe, and of course wider afield.

The need to maintain or increase competitiveness and profitability will also put pressure on companies to respond to this challenge. To fail will imperil their survival in the long term, and maybe even in the shorter term.

So there is a lot of pressure, both regulatory and voluntary, to produce safe food from aquaculture. How do you do it?

The current legislation and guidelines at international level are centred on the Hazard Analysis Critical Control Point (HACCP) approach. Much has been written about HACCP: for more information both *Codex Alimentarius* (Basic texts on Food Hygiene - see references) and the National Advisory Committee on Microbiological Criteria for Foods (NACMCF) have put out very useful guidelines.

However, Garrett and Hudak-Roos (1992) stated that "*HACCP is a non-traditional inspection system. It is a system that does not require continuous inspection, and as such, separates the nice from the necessary, or the essential from the non-essential. This separation allows proper focusing of limited resources. Under HACCP the inspection frequency should be much less than that currently employed under a traditional inspection approach ... or relying on end-product examination, when the product is produced under unknown hygienic operations such as would be the case with imports.*"

HACCP requires proponents of the system to think - is this control step that I am putting in essential (Critical) or not. If not, then why am I doing it? Often, analyses done using traditional sampling and measurements are no longer needed under the HACCP system.



Another important point of the HACCP approach is that food operators bear full responsibility for the safety of the food they produce (in EC terms this is known as “own checks”). Of course, this extra responsibility means extra costs. The whole issue of the economics of implementing HACCP is a topic of research, but with no hard and fast rules - yet. Cato (1998) has reviewed the economics of HACCP programmes in the fisheries sector, but concludes there is still a lot more to be done to be able to definitively determine the cost benefits. There are many economists and technologists now addressing this issue.

This HACCP approach, however, is one tool in the technical know-how necessary to ensure total product quality (including safety) for consumers. It must be seen and implemented as part of a total system including good aquaculture practice, plant design, hygiene and cleaning, training and pest control and others. Working with my colleague, Professor Han Henrik Huss, we have identified 13 such “pre-requisite programmes” as the necessary building blocks upon which HACCP is built. Various efforts on this issue identify varying numbers of programmes, but essentially they all lead to the same goal - provide the proper foundation for HACCP.

The early work on HACCP in the fisheries sector focused on the hazards in the marine capture sector and on the processing of fish. The hazards identified were mainly microbiological (bacteria, viruses, parasites) with chemical (heavy metals, biotoxins, histamine) and physical hazards (glass, metal fragments) also identified and controlled. Key to the control system was an understanding of the risk posed by these hazards. It is a combination of accurate knowledge about the hazards and the risks associated with fish and shellfish that allows proper control of the food.

What differentiates aquaculture from the capture fisheries is farming versus hunting. The fish farmer has more control of species selection, location of the farms (closeness to market), fish size, growing conditions, matching market demand and others. However, this means more to monitor and control with regard to possible safety issues.

Over the last decade, and mostly in the latter half of the 1990s, there have been significant international efforts to apply the HACCP concept to aquaculture, most notably a joint FAO/WHO/NACA initiative culminating in a publication (WHO, 1999). This weighty tome gives particular attention to biological hazards, such as bacteria, viruses and parasites and chemical hazards, such as agro-chemicals, chemotherapeutants, heavy metals, feed components and organic pollutants. In this sense, the main differences lie in the chemical hazards associated with aquaculture. In general, aquaculture in inland waters carries a greater risk of contamination from agro-chemicals, while aquaculture in estuaries is more susceptible to contamination from industrial pollutants.

The report also considers the strategies for food safety assurance, focusing on risk assessment and HACCP applied to aquaculture, identifying four processes that might be considered critical.

- Site selection
- Water quality (used for growing)
- Feed supply
- Production (grow-out)

Garrett *et al.* (2000) have also addressed the same issue and concluded that in catfish there were three areas that were critical. They mirrored the above, but excluded site selection.

Earlier in this paper, I talked about Brundtland’s “third wave” of food safety, i.e., that based on risk analysis.

This approach is not something appearing suddenly, as scientists have been talking about risk assessment for many years. However, WHO, amongst others, are now promoting what is called "Risk Analysis". I am putting the phrase in quotes, as in this context, risk analysis has a specific meaning. It is defined as covering the three aspects of:

- risk assessment
- risk management
- risk communication

The best way to describe these is through the use of a diagram (see below) which shows the three components against the four main "partners" in risk analysis, namely, government, industry, science/research and the consumer.

In general the role of the three "partners" is fairly self-explanatory. Assessment must be done by those who have the scientific knowledge and capability to assess the risk at various points in the food chain. They must be independent of the managers. Risk assessment, where possible, must be based on scientific fact. I say, where possible, as there is much work to do to be able to claim a qualitative, never mind a quantitative knowledge on all risks associated with foods. Witness the BSE crisis.

Risk management is the responsibility of governments to provide the framework against which measures will be taken. It will audit, monitor, and control. Industry also has a responsibility for risk management. The HACCP approach and pre-requisite programmes are most effective in this respect.

Risk communication is the responsibility of everyone. It includes making sure that the whole risk analysis approach is transparent to the consumer, that the risks of eating food are transparent to the consumer and that ways of reducing the risks are relayed to the consumer.

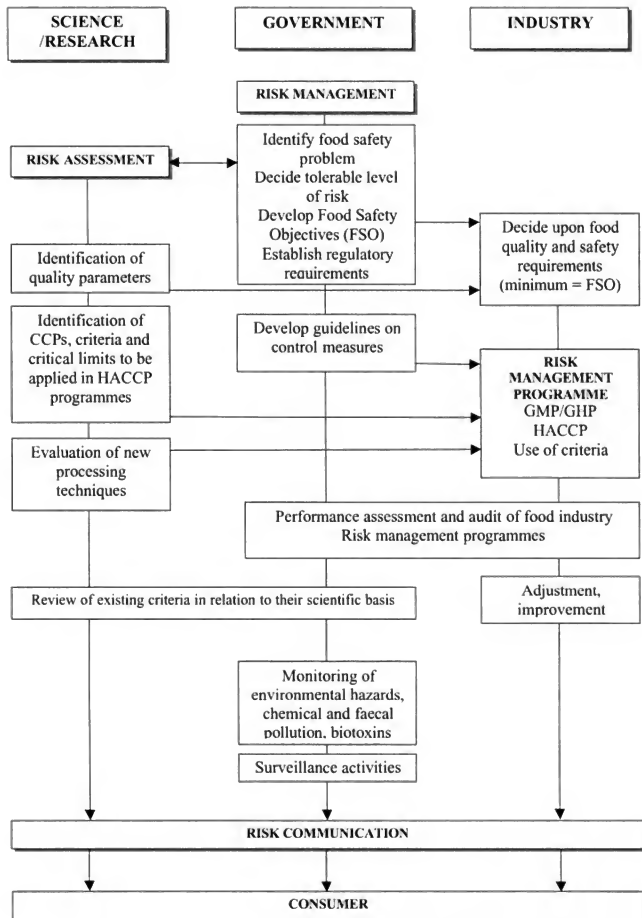
If and when this is done properly, then the food industry might be able to regain consumer confidence.

### **Impact on production**

If an aquaculture company is already practising good aquaculture practice (proper management of water quality, control of disease, correct use of drugs and other chemicals, etc), and if the company is also a processor, is using the pre-requisite programme and HACCP systems, then impact on production will be low. Clearly, if the opposite is the case, then the impact for that company will be high and negative. It may mean that production will cease in extreme circumstances.

In overall industry terms, it will depend on how many "good" companies and how many "bad" companies exist. It may in the short term, also depend on the markets being targeted and the status of legislation with regard to local companies. Countries moving to accession to the European Union will not necessarily yet have the "equivalent" legislation in place, and so poor practices will have less of an impact on production. In the longer term, most of Europe will be following the same rules and impact will be higher.

At the governmental level, it will depend on how much "risk management" the government is doing, and importantly how much communication is occurring.



There is a cost element to all this, and across Europe investment is going to be needed both at governmental level - in risk management and communication and in funding risk assessment, and at the private sector level - in installing new equipment, designing new processes and undertaking training for employees.

On a more positive note, aquaculture does have opportunities, as it is a farming industry, and does have the control over the production that the wild fishery sector could only dream about. With an effective food safety system in place and being used properly on a daily basis, then companies will be in a position to "market" this and add "one more piece in the puzzle" of competitive advantage.

However, as a final note of caution, the cost of placing unsafe food products on the market will be detrimental to the industry in terms of product rejection and its reputation, and to governments in the cost of food borne disease (Reilly, Howgate and Kaferstein, 1997).

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**Quality, traceability and labelling in aquaculture?  
A must to become a preferred supplier!**

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**ABSTRACT**

Over the last century, the global and European aquaculture industries have increased significantly in importance. Due to stagnation or even decline in wild marine harvests, medium term prospects for the aquaculture sector look good.

The fast growth of the industry has not been without conflicts particularly relating to food quality and the environment but also to other activities (such as tourism). Since the industry is relatively young, it is currently facing similar development problems that previously affected the meat industry. Food scandals have increased attention to fish products as a perceived 'green', healthy and pure alternative to meat products. For the last few years, the aquaculture industry has had to develop management systems in a pro-active way in order to show its credibility to the end consumer and reassure product quality. As a result of the increased market demand for fish products, an increasing number of aquaculture and fisheries certification programmes have been developed, or are under development. These programmes can be used as a model by the European freshwater aquaculture sector, which either join successful and relevant ones or to draw on these and build a tailor-made scheme for their own market. Independent verification of product and process claims on aquaculture products is a prerequisite for a successful programme. Aquaculture producers should be stimulated by the EC to join or develop a market-oriented production scheme in cooperation with other stakeholders to be assured of market acceptance. Verification criteria would need to include elements relating to food safety, traceability and good aquaculture practice thereby minimising detrimental environmental effects.

**Scope**

Aquaculture in Europe covers a wide range of husbandry practices ranging from traditional carp and trout farming in earthen ponds to recirculation systems and cage culture. Some farming systems have been in operation for more than 100 years (e.g., trout farming) whereas fish farming in cages and fish farming in recirculation units are comparatively young industries. Due to various factors, including food scandals, stagnating wild marine harvest and changed consumer behaviour, market demand for aquaculture products has increased. Thus plausible medium term scenarios suggest that the European aquaculture sector could grow in the coming years. The European Commission considers that aquaculture can contribute further to reducing the substantial deficit in fish supply in the European Community and to creating employment in areas where alternatives to fish based enterprises are rare. As a result, the European Community is supporting aquaculture enterprises in several ways. Possibilities for support are currently outlined in the discussion document (Green Paper) prepared to consider formal Changes in the Common Fisheries Policy by the end of 2001.

For the last few years, the aquaculture industry has had to develop management systems in a pro-active way in order to show its credibility to the end consumer and reassure their product quality. As a result of the increased market demand for fish products, an increasing number of aquaculture and fisheries certification programmes have been developed or are under development. These programmes can be used as a model by the European freshwater aquaculture sector to either join successful and relevant ones or to draw on these and build a tailor-made scheme for their own market. Independent verification of product and process claims on aquaculture products is a prerequisite for a successful programme. To facilitate the

needs of the industry, SGS has become accredited or has assisted in the development of various inspection, certification and testing programmes for the aquaculture and fisheries industry worldwide.

In this paper, an overview of some aquaculture and fisheries (sustainability) labelling programmes is presented as well as opportunities and constraints related to quality, traceability and labelling of fish products.

## Overview of Programmes

### (a) FAO Code of Conduct for Responsible Fisheries

Initiated in 1991 by the FAO Committee on Fisheries (COFI), developed in a multi-stakeholder consultation process, and adopted in 1995 by the over 170 Member Governments of the FAO Conference, the Code of Conduct for Responsible Fisheries (CCRF) represents the most significant globally recognized international framework relating to the world's marine, coastal and inland fisheries, including aquaculture. Based on major international agreements (UNCLOS, UNCED, CBD), the voluntary Code sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with respect for the ecosystem and biodiversity. The Articles of the Code cover all major issues and practices in fisheries, including fisheries management, fishing operations, aquaculture development, integration of fisheries into coastal area management, post-harvest practices, trade, fisheries research, general principles, provisions related to its implementation, monitoring, updating, and special requirements of developing countries.

Progress in implementing the CCRF, at national, regional and global levels, is monitored and regularly discussed at COFI. However, implementation of all CCRF provisions is far from complete. Many fisheries and aquatic environments continue to suffer from inadequate management, significantly affecting resources and benefits.

The objectives of the Code are to:

- (a) establish principles, in accordance with the relevant rules of international law, for responsible fishing and fisheries activities, taking into account all their relevant biological, technological, economic, social, environmental and commercial aspects;
- (b) establish principles and criteria for the elaboration and implementation of national policies for responsible conservation of fisheries resources and fisheries management and development;
- (c) serve as an instrument of reference to help States to establish or to improve the legal and institutional framework required for the exercise of responsible fisheries and in the formulation and implementation of appropriate measures;
- (d) provide guidance which may be used where appropriate in the formulation and implementation of international agreements and other legal instruments, both binding and voluntary;
- (e) facilitate and promote technical, financial and other cooperation in conservation of fisheries resources and fisheries management and development
- (f) promote the contribution of fisheries to food security and food quality, giving priority to the nutritional needs of local communities;
- (g) promote protection of living aquatic resources and their environments and coastal areas;
- (h) promote the trade of fish and fishery products in conformity with relevant international rules and avoid the use of measures that constitute hidden barriers to such trade;

- (i) promote research on fisheries as well as on associated ecosystems and relevant environmental factors, and
- (j) provide standards of conduct for all persons involved in the fisheries sector.

The Code also includes a section on Aquaculture Development and the FAO Fisheries Department has published technical guidelines for Aquaculture Development in support of the implementation of the Code.

There have been national and regional measures taken to implement the Code such as:

- Australian Seafood Industry Council which published, and made available on the Web, a Code of Conduct for a Responsible Seafood Industry. This Code sets out principles and standards of behaviour for responsible practices in the seafood industry. These practices are intended to ensure the conservation, management and development of living marine resources. The Code is part of a series of initiatives by the Australian seafood industry to ensure that it continues to operate in an ecologically sustainable manner.
- The United States National Marine Fisheries Service, National Oceanic and Atmospheric Administration, of the Department of Commerce, has made available its Implementation Plan for the Code of Conduct for Responsible Fisheries on the Web.
- Fisheries and Oceans, Canada is in the process of developing a Canadian Code of Conduct for Responsible Fisheries Operations. A summary report on the process is available on the Fisheries and Oceans Canada official website.

The FAO Code of Conduct focuses primarily on production and process quality rather than labelling or traceability issues. No mandatory independent third party verification, certification and/or surveillance is included in the CCRF. For more information visit the FAO Fisheries Department website at <http://www.fao.org/fi>.

#### **(b) FEAP Code of Conduct**

The Federation of European Aquaculture Producers (FEAP) has produced a Code of Conduct in the spring of 2000. The primary goal of this Code is to promote the responsible development and management of a viable European aquaculture sector in order to assure a high standard of quality food production while respecting environmental considerations and consumer's demands.

As a Code of Conduct, it serves to establish and recommend guiding principles for those in Europe who are producing live species through aquaculture. The Code does not seek to distinguish between the species nor the types or scales of farms that are encountered within the European aquaculture sector.

Its purpose is to establish common ground, through effective self-regulation, for sectoral responsibility within society and demonstrate the considerations of the production sector towards the species it rears, the environment and the consumer.

The FEAP has developed this Code of Conduct with specific reference to:

- the provisions for responsible aquaculture development contained in the FAO CCRF (FAO, 1995);
- the FAO Technical Guidelines for Responsible Fisheries No. 5: Aquaculture Development (FAO, 1997);
- the Holmenkollen Guidelines for Sustainable Industrial Fish Farming (Oslo, 1994);
- the Holmenkollen Guidelines for Sustainable Aquaculture (Oslo, 1997);



- the ICES Code of Practice on the Introductions and Transfers of Marine Organisms (Copenhagen, 1994), and
- Codes of Practice and Manual of Procedures for Consideration of Introductions and Transfers of Marine and Freshwater Organisms (EIFAC, 1988);
- The Report on the Welfare of Farmed Fish (Farm Animal Welfare Council UK, 1996).

The Code is not definitive but addresses those areas that FEAP considers to be important and of prime concern. Additionally, the role of the Code is to motivate and assist the development of best practices. Moreover, it is assumed that European and national legislation provides minimum standards for aquaculture. This Code can serve as the basis for the development of individual national Codes of Practice in order to interpret and apply existing standards and to develop, refine or improve standards, as required.

The FEAP Code of Conduct focuses on production process quality rather than food safety, labelling or traceability issues. No mandatory independent third party verification, certification and/or surveillance is included. For more information visit the FEAP website at <http://www.feap.org>.

#### (c) EUREP-GAP

The Euro-Retailer Produce Working Group (EUREP) (for fruit and vegetables) was founded in 1997 and is made up of leading European food retailers including:

- Laurus – The Netherlands
- TSN – The Netherlands
- Superunie – The Netherlands
- Albert Heijn – The Netherlands
- Royal Ahold – The Netherlands
- ASDA – UK
- Tesco – UK
- Safeway – UK
- Waitrose – UK
- Sainsbury's – UK
- Marks and Spencer – UK
- Superquinn – Ireland
- Delhaize – Belgium
- GBB-CABBAC – Belgium
- GBB-CABBAC – Belgium
- Continent – France
- Promodes – France
- Coop – Italia
- Spar – Austria
- Coop – Norway
- ICA – Sweden
- KF – Sweden
- Kesko – Finland

The objective of the EUREP group is to raise standards for the production of fresh fruit and vegetables as well as livestock, including aquaculture, for mandatory use by retail suppliers. In November 1997, EUREP agreed on the first draft protocol for Good Agricultural Practice (GAP). This represented the first step towards integrated production. In September 1998, the EUREP initiated pilot trial projects to verify the implementation of EUREP-GAP in the field

conducted by SGS AgroControl. Advanced producers in Spain (MARTINAVARRO) and Italy (APO) were audited against the draft EUREP-GAP fresh fruit and vegetable standard.

In the meantime the EUREP group has opened its technical sub-groups to other organizations. Non-retailers are now able to become associated members of EUREP and enjoy the benefits of being actively involved in the development of the EUREP-GAP Protocol and its framework.

In 1999, the first official version of the EUREPGAP Protocol, dated August 7th, 1999 was subject to consultation with growers, produce marketing organizations, verification bodies, agro-chemical companies, farmers organizations and scientific institutions. All comments were considered and many of them were included in the new official GAP Version 2000 .

The results from the trials and the new official GAP Version 2000 were presented on the occasion of the EUREP Launch Meeting on November 17th, 1999 in Paris.

Since then, EUREP has also started to draft an Animal Production standard including an aquaculture section. The contents of the aquaculture standards were discussed for the first time during the February 2001 EUREP-GAP meeting in Amsterdam. Adaptations relevant for aquaculture operations were proposed to the latest version of the animal production standard.

The EUREP-GAP programme focuses on production process quality, labelling, traceability and to some extent on food safety issues. Mandatory independent, ISO Guide 65 accredited, third party verification, certification and surveillance is included in the EUREP-GAP programme. SGS Product and Process Certification (The Netherlands) is in the process of becoming a EUREP accredited certification body to undertake worldwide certification through local SGS offices. For more information visit the EUREP website at <http://www.eurep.org>.

#### **(d) Safe Quality Food 1000/2000**

Food safety has become an issue of critical importance to all food businesses in recent years with several examples of food safety incidents highlighted in the media. This has increased public concern regarding the safety of food supply in general and high-risk products in particular. Consumers and governments are demanding safe food, and these demands are being passed back along each step of the food supply chain, ultimately ending with the food producers.

Agriculture Western Australia (WA) has recognised the need for industry to adopt Quality Assurance (QA) systems as an important means of maintaining and increasing market access. It is important to recognise that quality systems, and the HACCP methodology in particular, are as much about international trade as they are about food safety. The absence of such systems will increasingly constitute a barrier to accessing export markets

There is no universally recognised standard for food safety or quality. However, there has been a proliferation of industry and regulatory driven Quality Assurance (QA) programmes across the agri-food sectors in recent years. Different segments of the supply chain have developed specialised QA programmes in response to perceived risks, potential price premiums and customer requirements.

SQF Australia has developed a course, at the request of industry, to alleviate some of the deep sense of confusion and frustration throughout the agri-food industry about the applicability of the variety of QA systems available to individual businesses. Quality Assurance does not necessarily have to be complex; however sometimes unusual terminology is used and can cause confusion.

Most producers already do much of what is required of a quality assurance system in their day to day management and thinking, but at the end of the day, as far as the customer is concerned "if it isn't written, it didn't happen" still applies.

The SQF 2000 Quality Code was developed and launched in 1995 in response to the demand for a user-friendly quality assurance system tailored specifically to meet the needs of the food businesses. The SQF 1000 Quality Code was developed in 1999 in response to the demand for a simple HACCP - based approved supplier food safety system for primary producers.

Since 1995, SQF Management Systems have continued to expand and demonstrate their wide applicability across businesses in a range of production, distribution and retail sectors in both Australia and overseas. Agriculture WA recognised the need for Australian agriculture to adopt Quality Assurance (QA) systems as an important means of maintaining and increasing market access. It is important to recognise that quality systems, and the HACCP Methodology in particular, are as much about international trade as they are about food safety. The absence of such systems will increasingly constitute a barrier to export markets.

SQF Management Systems are:

- To raise standards of food safety and quality across the food chain, from primary producer to consumer through increased awareness, understanding and adoption of SQF Management Systems;
- To continuously improve and deliver high standards of customer service and support to SQF clients;
- To continue to pursue increased recognition of SQF Management Systems by customers and clients in new and existing markets; and
- To maintain and protect the high level of integrity of SQF Quality Codes.

The uniqueness of the SQF Programme lies in the fact that it is itself a practical management tool to control food safety and food quality issues. Companies can develop the contents of their SQF system as far as they wish or is required by their clients. SQF is nowadays widely spread with primary and secondary producers in Asia and only now starting to get known in Europe and the United States. The first aquaculture producers certified against SQF1000 standard in Australia were oyster farmers. Currently, major European food retailers are considering recognition of SQF2000 certified operations as an alternative to BRC (British Retail Code) certification.

The SQF programme focuses primarily on the management of food safety and food quality which usually includes traceability. Certified operations are eligible to label their produce with the SQF logo. Mandatory independent, SQF accredited, third party verification, certification and surveillance is included in the SQF programme. SGS is an SQF accredited certification body to undertake worldwide certification projects through local SGS offices. For more information visit the SQF website at <http://www.sqf.wa.gov.au>.

#### (e) Global Aquaculture Alliance

The Global Aquaculture Alliance is an international, non-profit trade association dedicated to advancing environmentally responsible aquaculture. GAA recognizes that aquaculture is the only sustainable means of increasing seafood supply to meet growing food needs. As its top goal, GAA is working to finalize the *Responsible Aquaculture Program* of certifiable standards for responsible aquaculture. At program completion, participants will achieve GAA certification and licensed use of a special packaging label.

Over the past several years, the Global Aquaculture Alliance has developed the *Responsible Aquaculture Program* to provide certified products to those who want assurance that it is environmentally responsible to buy farm-raised seafood. More importantly, this GAA program is also intended to improve the efficiency and long-term sustainability of the aquaculture industry.

The core of the Responsible Aquaculture Program is a system of certifiable standards for sustainable aquaculture farming. Now nearing completion, the program encourages both small- and large-scale producers, processors, marketers and retailers to recognize and implement management practices that address these standards. Although the program focuses on shrimp, many of its elements can be applied to other species.

The strong worldwide diversity in farm design and management makes it impractical to expect all shrimp operations to achieve programme standards in the same time period. The *Responsible Aquaculture Program* is therefore based on the concept of continuous improvement. At completion, participants achieve GAA certification and are licensed use of the Responsible Aquaculture Program packaging label.

The GAA programme focuses primarily on the management of shrimp farming and processing operations and also includes traceability elements. Certified operations are eligible to label their produce with the GAA logo. Mandatory independent, GAA accredited, third party verification, certification and surveillance is included in this programme. SGS Product and Process Certification (The Netherlands) is in the process of becoming a GAA accredited certification body to undertake worldwide certification projects through local SGS offices. For more information visit the GAA website at <http://www.gaalliance.org>.

#### **(f) Marine Stewardship Council**

The MSC, founded by Unilever and WWF in 1997, now operates independently and has succeeded in bringing together a broad coalition of supporters from several organizations around the world with a stake in the future of the fishing industry. The MSC is now one of the leading voices in the marine conservation community. It is a global charitable organization with its international headquarters in London. It is crucial that the MSC operates openly and transparently. The MSC programme only works through a multi-stakeholder partnership approach, taking into account the views of all those seeking to secure a sustainable future.

To date, more than 100 major seafood processors, traders and retailers have pledged to buy MSC-certified products. In addition, the MSC has the support of the Consumer Choice Council, the Natural Resources Defense Council, the Coalition for Marine Conservation and the National Audubon Society among others. In the UK, all the major retailers are MSC signatories and the MSC has the support of several organizations across the rest of Europe.

The Western Australia rock lobster fishery and the Thames Blackwater herring fishery in the United Kingdom were the first two fisheries to carry the eco-friendly MSC Label - their certification was announced in March 2000. Alaskan salmon's certification was announced in early September. More than a dozen fisheries are currently working towards MSC certification.

The MSC programme currently only focuses on management of wild marine resources and Chain of Custody issues though it is planning to conduct a feasibility study this autumn to determine the viability of an MSC aquaculture programme. Certified operations are eligible to label their produce with the MSC logo. Mandatory independent, MSC accredited, third party verification, certification and surveillance is included in the MSC programme. SGS Product and Process Certification (The Netherlands) is an MSC accredited certification body undertaking worldwide MSC fishery management and Chain of Custody certification through local SGS offices. For more information visit the MSC website at <http://www.msc.org>.

The EC has recently (February 2001) issued a draft publication entitled 'A Community Approach towards Eco-Labeling of Fisheries Products' in which it is stressed that national Public Authorities should require that all eco-labelling schemes for fisheries comply with the following requirements:

- objective and verifiable criteria which means that the criteria for certification of eco-labelled products shall be precise, objective and verifiable;
- independent assessment and control which means that eco-labelling schemes shall be independently and continually controlled and shall ensure the accurate identification of the product throughout the fishing chain. A body that meets the requirements of EN 45011 (equivalent to ISO Guide 65) shall itself accredit the certifying body;
- open access which means that eco-labelling schemes shall not discriminate in terms of access to certification and;
- accurate information to the consumer implying that the criteria used to assess the eligibility of the product for the eco-label shall be available to the consumer. Product information at the point of sale should reflect the assessment undertaken.

#### **(g) Organic Aquaculture**

For more information specifically related to organic aquaculture see the paper of Bergleiter (this Workshop). However, it should be stressed that currently there are no internationally binding organic aquaculture regulations which implies that standard setting is still a private law-based activity by certification bodies.

The organic aquaculture certification programmes currently in operation focus on production process quality and Chain of Custody rather than food safety. Mandatory independent, third party verification, certification and surveillance is included in the organic certification programmes. SGS Product and Process Certification (The Netherlands) is an RvA (Dutch Accreditation Council) ISO-Guide 65 accredited organic certification body to undertake worldwide organic aquaculture and Chain of Custody certification through local SGS offices. For more information visit the SGS website at <http://www.sgs.nl/icm/agro>.

#### **(h) Private Label Schemes and/or Best Management Practices**

There are many private label or industry-related aquaculture production schemes (such as Scottish Quality Salmon) which can vary in focus from the aquaculture operation process (incl. Best Management Practices or Codes of Conduct) to product quality, labelling and could also include product processing characteristics.

The set-up of such schemes differs very much and depends on the characteristics of the industry and the market for the product.

#### **(i) Mandatory EU Labelling of Fish Products**

An EU Labelling requirement has been issued to take effect sometime next year that will require fish products to be labelled all along the production chain. Fish products must be labelled indicating the production site location, producer name and whether the product is wild or farmed.

Recent experience with labelling of beef products has been gained by EAN International, with EUREP-GAP support, as the co-Chair of the Fresh Produce Traceability Project at EAN International. Relevant documents can be downloaded directly from the EAN site <http://ean.eurosecure.net/fptdocs.html>.

#### **Opportunities**

This overview demonstrates that the trade potential from certified fish products is becoming a reality very fast. Increasingly it is a prerequisite to become a preferred supplier. The experience in the development and running of each particular programme has also shown that realising this potential is sometimes not easy or straightforward, with a number of policy and business issues to be dealt with along the way. A number of reforms that could be introduced

to broaden the range of companies and countries that can benefit from the opportunities are indicated.

#### *A new trading opportunity*

In the past, governments and business have pointed to the growth in the environmental services industry as a signal that sustainable development can bring new incomes and jobs. This sector is mostly linked to pollution abatement and waste management, and was estimated to have a global size of US\$ 200 billion in the early 1990s, growing by 50 percent by 2000. The market for sustainable production and consumption is much larger, but its relative novelty means that it is difficult to gain a reliable sense of the market potential. Case studies indicate that a rough order of magnitude estimate would suggest that about 1 percent of OECD consumption can currently be classified as sustainable, rising to as much as 10 percent for particular products in environmentally conscious markets. Growth rates also appear to be high, often between 5-10 percent. Although 1 percent appears small, in money terms the opportunity can already be substantial, as witnessed by the US\$ 160 billion market for environmentally-sensitive tourism and the US\$ 500 million premium paid by northern countries for organic produce from the south.

#### *A new way to add value*

In the fast-moving and increasingly competitive global marketplace, raising the social and environmental performance of their exports is a way for developing country producers to differentiate their product and add value. This is particularly important for commodity-dependent developing countries, where sustainable consumption markets in the North offer a magnet for fairly-traded organic produce.

#### *The benefits are real*

Case studies show that the benefits of improving social and environmental performance through certification of export products, are real and come in many forms:

- **Economic:** Producers have gained from premium prices, rising volumes and sometimes a combination of the two. While premiums appear important to stimulate initial investments, they are not always necessary once an initiative is up and running. To become a preferred supplier requires an investment in the early stages, before one can start harvesting.
- **Social:** Some of the social benefits are a direct spin-off of financial success, with communities receiving extra income for vital projects. In other cases, the benefits come in the form of improved health and safety, job creation and employment security.
- **Environmental:** Gaining environmental benefits was the starting point in some of the programmes, and all have contributed to improving environmental sustainability. More importantly, it is clear that successful producers do not stand still when a particular environmental problem is resolved; they look ahead to anticipate emerging trends: continuous improvement!
- **Security:** Increased security about long-term prospects has often been among the most important benefit for producers, particularly small-scale operators. For example, partnerships with other organizations are often vital to provide the stability needed to invest in production.

#### *Pioneers can make a difference*

Some of the programmes have shown that pioneering companies, non-governmental organizations, communities and cooperatives can make a real difference, often ahead of regulations or consumer demand. This reflects the fact that experience to date with sustainable consumption is market-driven. Regulators and government agencies can assist this process, or stimulate action, but they are not the primary actors. What matters is the commitment of the producers and their commercial partners along the product chain.

### *Combining Quality and Sustainability*

The programmes show that producers and consumers have matured considerably since the 'green consumer' phase of the late 1980s. There is less emphasis on marketing, and more on demonstrating and sustaining improvements in actual performance over time. Furthermore, most programmes highlight the central importance of combining basic food and product quality (food safety) with sustainability (ranging from BMP to organic) as one cannot sell a concept only, but one is selling a product. Across the programmes, the product is no different -- and is often better -- in quality terms than conventional alternatives. There is thus no need to accept a lifestyle shift to lower quality goods to promote sustainably.

#### *No-one can do it on their own*

In most successful programmes, the producer was supported by a range of other actors. In other cases, new commercial relationships have been crucial, particularly the intervention of non-governmental environment and development intermediaries.

#### *Nothing is free, but sustainability need not be confined to luxury markets*

The establishment of all the programmes requires investments of financial resources and time to get going. But often the outlays were small, and were recouped through the combination of better prices and higher volumes. Even in cases where producers gain an explicit premium for their goods, this need not lead to excessive prices to the final consumer, as production costs make up such a small proportion of the final price. This means that sustainable products are not just something for upper income groups. However, in the early stages, 'sustainable' products are often more expensive than conventional goods because of low volumes and high overheads. This issue of building economies of scale is something now being addressed in many of the cases.

#### *Consumers need performance guarantees*

One of the downsides of the 'green consumer' movement was the explosion of often misleading claims, breeding frustration and cynicism. Central to nearly all the described programmes is the importance of clear standards and independently verified performance to guarantee that any marketing claims can be substantiated. But there are costs associated with this approach (discussed below).

#### *Building a supportive policy framework*

Policy choices also make a difference to the success of these cases -- and also to their spread. Developing country governments can develop strategic frameworks which support the diversification of investments in the direction of sustainability and assist the process of transition in sectors affected by changes in export market expectations. Importing countries also have a responsibility and some cases show how small quantities of development assistance can achieve high leverage in the transition phase.

#### *A long-term vision of change*

At their core all programmes contain seeds of a long-term vision of change in production, consumption and trading patterns, which involve:

- Moving from a reactive response to individual problems as they arise, to a culture of innovation that encompasses life cycle responsibility.
- Strengthening the emerging partnerships in the marketplace between producers, their clients, retailers, ethical trading organizations and government agencies.
- Accelerating the convergence between the social and environmental dimensions of sustainable trade.

## Constraints

Although explicitly chosen for the positive way in which producers have perceived the trade potential of sustainable consumption, the programmes also illustrate barriers to progress.

### *Trade barriers and protectionism*

Trade barriers in the industrialised world still provide a major constraint on the willingness of producers to invest in change. But, trade restrictions in developing countries can also be an impediment, by limiting access to cleaner technologies and inputs.

### *Perverse regulations*

In addition to trade restrictions, unnecessarily bureaucratic or indeed discriminatory regulations in industrialised country markets can also hinder access. Examples include the bureaucracy facing organic producers seeking to export to the European Union market, and the fumigation requirements for imported organic produce in the USA, which destroy their organic status. The textiles case also shows the need for better dialogue and longer lead times to allow developing countries to adjust to new regulatory requirements.

### *Capacity constraints*

While large-scale and well-resourced firms are able to absorb the conversion costs when going organic, this is not the case for many small and medium sized enterprises, who lack the necessary technological, managerial and financial resources. The only way to cope with these capacity constraints is to provide transitional support from external sources either from government agencies, through local trade associations or along the product chain from clients and NGOs.

### *The cost of certification*

The problem of scale also constrains the take-up of certification by small producers. There are two ways around this: certification through local SGS offices and training local inspectors to reduce fees.

### *Filling the supply gap*

Guaranteeing regular supply of a consistent quality is a major headache for importers and retailers committed to sustainable trade.

## Conclusions and Recommendations

'Unlocking the European freshwater aquaculture production potential' is clearly an important way in which European countries can reap benefits from the change to market-driven, sustainable production and consumption. But it is not the only strategy for change, and it is important to place the 'production potential' in context. Most environmental and social problems are not amenable to trade-based strategies: in some cases only a small proportion of local produce enters international trade; most is consumed locally. Here, as with most environmental problems, tightening domestic environmental regulations, improving corporate and governmental accountability and strengthening environmental capacities in the public, private and civil sectors are critical to success.

Where the production potential is particularly promising is in those sectors of European freshwater aquaculture, open to international markets and trends. These are set to grow as the pace of globalisation, driven by trade and investment flows, accelerates. Unaided, this process is unlikely to bring the transformation in production, trade and consumption patterns that the global goal of sustainable development requires. Based on the experience gained from the currently operational programmes, there are a number of specific steps that could be taken by governments, business and citizen groups to unlock the production potential for others.



*Governments* should:

1. Improve market access for sustainably produced goods and services from the aquaculture and fisheries sectors.
2. Review existing product regulations and remove unnecessary measures which constrain 'sustainably and safely' produced fish products.
3. Provide transitional financial and technical support to develop capacities in export sectors alongside the introduction of new regulations, particularly for small and medium-sized enterprises.
4. Develop clear guidelines for transparency, consultation and transitional phasing for proposed regulations.
5. Uphold the consumer's 'right to know' and insist on independent verification of safe quality/sustainably produced food standards.
6. Introduce and enforce legislation which provides producers with a firm foundation for accessing export markets.
7. Reform agriculture, energy and other subsidies to remove perverse incentives for pollution and resource depletion.
8. Seek out opportunities for integrating high food safety and quality (social and environmental performance) in official export promotion strategies.

*Funding agencies* for multilateral environmental agreements should:

9. Invest in life cycle product innovation rather than just replacement.

*Business* should:

10. Develop stronger relations with clients in export markets, and move towards independent verification of their food quality and safety performance. E-business developments, also in the fish business, will speed up independent verification of business practice even more.
11. Develop principles for 'sustainable' trade with producers in developing countries, incorporating food safety and quality dimensions, and carry out independent reviews of progress.

*Business and citizen organizations* should:

12. Work together to develop further the 'stewardships council' approach, extending it to other sectors beyond marine resources and making the links between the social and environmental dimensions of sustainability.

*Environment, Development and Consumer Organizations* should:

13. Share experience of different approaches to improving trade from the food safety and quality perspectives.

*All partners* should:

14. Explore options for a shared code of conduct for safe and sustainable trade in fish products, promoting the further convergence of food safety, quality and environmental concerns and integrating the requirements of producers, workers, traders, retailers, regulators, citizen groups and consumers. This code would be informed by existing sourcing policies of leading international corporations, as well as the rapid evolution in social and environmental practice under the range of specific codes and standards that are now operational.

The trade implications of well-managed operations and safely produced fish products consumption are still uncertain, but the programmes described suggest that there are positive lessons to be learned. If the suggested steps are introduced, then the prospects look good for a fast growth in trade, based on sustainable and safe production and consumption, well before the next EC Green Paper is published.

## **Organic products as high quality niche products: background and prospects for organic freshwater aquaculture in Europe**

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### **ABSTRACT**

An overview of the organic movement and the principles of organic aquaculture, focusing on the development of standards and technical and marketing aspects. It is suggested that there is a future in Europe for organically certified aquaculture, but that laws and regulations should be generated in a flexible manner.

### **Preface**

A closer look at the food market today reveals an astonishing variety of product labels dealing with “green” topics as diverse as use of animal testing in cosmetics development, “bird-friendliness” of coffee-plantations and dolphin bycatches in tuna-fisheries. In future this can be expected to increase with the number of food scandals (BSE, toxic residue levels, abuse of hormones in animal feed etc.).

While many labels and certification initiatives, at first glance, focus on particular aspects, ignoring other equally relevant ones, there are two types of certification with a broader, and therefore, more complete approach:

The first is certifying good practice, based on the broad consensus of a well-managed industry. The objective here is to maintain (or renew) the good reputation of a certain branch, especially if threatened by negative headlines, and to ensure stable product quality. In aquaculture, this direction is represented by such various regional and national logos as the “Scottish Quality Salmon/Tartan”, and by more international programmes such as the recently-started RFS and GAA Merge Fisheries and Aquaculture Labelling Program based on Codes of Practice for the different areas of industry.

The other is certification of food as organic produce. “Certified Organic” is not simply to be used as a synonym for sustainable or environmentally-friendly, but refers to a more or less fixed set of requirements for such production, covering aspects from origin of stock, feed and fertilisers to choice of production site, design of holding units, stocking densities, energy consumption and processing. This holistic concept implies farming in accordance with nature, respecting biological dynamics and cycles, seeking sustainability of all operations, and offering “pure” products derived from transparent processes to the consumer. The following explanations refer to projects run according to IFOAM (International Federation of Organic Agriculture Movements) basic principles, and certified by members of this world-wide umbrella organization.

### **1. Eco-labelling: certification and accreditation**

Organic farming, in a more organized and explicit form, goes back to the twenties of this century (e.g., the “land reform” movement and bio-dynamic agriculture). From the 1970s/1980s on, various farmer and consumer associations were founded in order to promote sustainable resource use and alternatives to highly intensified agriculture. This variety of pioneer groupings is still reflected in the large number of different certification programmes (e.g., nine programmes in Germany).

The on-product logos of programmes became an important guide to recognition of reliable organic quality. Whereas a number of certification bodies certify products all over the world, their marketing activities generally are concentrated on domestic markets, and certification

logos the highest degree of familiarity on the national level. Regarding the predominant type of labels, there are mainly two groups of countries (Huber 2000)<sup>4</sup>:

- countries, where national logos predominate. The products are usually certified according to the EU-regulation for organic products: France (Agriculture biologique), Denmark (Statkontrolleret Økologisk), Netherlands (Skal/Eko-keurmerk)
- countries, where private logos play an important role. Private logos are usually based on private standards, going beyond the requirements of EU-regulation: Austria (Ernte für das Leben)<sup>5</sup>, Germany (e.g., Bioland, Demeter, Naturland), Great Britain (SOL), Italy (e.g., AIAB, AMAB, CCPB, bioagricert), Sweden (KRAV), Switzerland (“Knospe”/bud)

The latest development is international logos, such as the IFOAM logo “IFOAM ACCREDITED”, issued by IFOAM accredited certifiers for international purposes.

For annual certificate renewal, the compliance with standards has to be checked each year by an independent, qualified and accredited inspection body; and additional spot-checks can be ordered. Based on the inspection report, the certification programme, usually by a special committee, makes the decision about certification.

Certification programmes at an international level (i.e., labelling products from different countries for the international market) are, on the one hand, obliged to observe the legal regulations for certifying bodies in general. Compliance with these requirements is confirmed by accreditation according to ISO Guide 65. On the other hand, due to varying popularity levels of a particular label in different countries, they have to seek the possibility to exchange their certification decisions with other certification programmes. This procedure, usually called re-certification, offers a producer the option to sell his product in different countries under different labels (also as an ingredient for processed organic products), without bearing extra inspection or certification costs.

Pre-condition for this exchangeability, however, is that the labelling programmes in question are both based on the same internationally accepted standard framework and certification procedure. This condition is guaranteed by accreditation through IFOAM, supplemented by the EU-accreditation for their control/inspection bodies.

## 2. Legal background

Earlier organic certification initiatives relied on their own definition of standards and certification procedures. This did not cause major problems, since marketing of the organic products was mainly done at the farm gate, based on the consumer’s personal confidence in the farming operation concerned. During the last decade, market volume and importance of – high priced – organic products drastically increased, and supply chains changed from regional to national or (e.g., in tropical crops) international. With this development, it became necessary to protect the consumer from being deceived by exaggerated label claims.

For this purpose, requirements for organic products have been codified in various instances, focusing on the technical conditions of such production as well the inspection and certification procedure:

<sup>4</sup> Huber, B. (2000) An European-wide logo overview. Proceedings 13<sup>th</sup> IFOAM Scientific Conference. 541.

<sup>5</sup> It is noteworthy that in Austria there exists a state label, which, however, has low public recognition and is not widely used - Zenner, S., Foster, C., Padel, S., Wirthgen, B. (2000) Comparative analysis of the impacts of marketing instruments on the organic market in Austria, the United Kingdom and Germany. Proceedings 13<sup>th</sup> IFOAM Scientific Conference. 523.

- FAO Codex Alimentarius “Organically Produced Foods” (1999), mainly based on IFOAM Basic Principles
- EU Council Regulation/EEC No. 2092/91 “Organic Farming” with supplementary national regulations of EU member states
- national regulations on organic agriculture in non-member states (e.g., Switzerland), mainly based on the EU Council Regulation

Organic aquaculture is still not included in this legislation; however, there are countries with their own national legislation on organic aquaculture (e.g., UK and France, both since 2000).<sup>6</sup>

As long as there are no specific national or international regulations, certification of organic aquaculture products in Europe remains a private law-based activity, legally falling under:

- legislation regarding protection of consumers
- legislation regarding fair competition on the market.

This means, that, even if there is no regulation, a certified organic aquaculture product has to fulfil justified consumer expectations about the general quality of an organic product, based on the international consensus on organic production (e.g., IFOAM<sup>7</sup>, FAO).

### 3. Principles of organic aquaculture

The main criteria for organic aquaculture have – as far as possible - been derived and transferred from organic agriculture. Due to the different ecology of the aquatic environment (e.g., structure of food-chains, percentage of carnivorous species) and special problematic aspects related to aquaculture operations (e.g., “no substrate farms” in virgin marine environments, need for high-protein diets), these original organic principles in many instances had to be supplemented and modified. A good example for this ongoing process is the fact that fish meal under certain conditions is now accepted as a prime feed material in organic aquaculture, whilst it is not permitted in organic agriculture. The main principles can be listed as follows:

- absence of GMOs (genetically modified organisms) in (brood-, seed-) stocks and feed focussing on vegetable feed ingredients (e.g., soy beans) and feed additives derived from biotechnology, as well as on transgenic, triploid and all-female stock
- limitation of stocking density; considering ecological capacity of site and species-specific behaviour of animals
- origin of feed and fertiliser from certified organic agriculture, no artificial feed ingredients; basic principle of organic production: networking of organic operations
- criteria for fishmeal sources; in general, decreased protein and fishmeal content of diets; trimmings of fish processed for human consumption or by-catches; no dedicated fishmeal harvesting operations are permitted

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<sup>6</sup> Early codification in a new sector of standard development clearly has positive and negative implications: on the one hand, an “official” regulation is thought to provide a solid legal backing to production and marketing of organic goods. This – if possible: international – backing may encourage more producers to join a new initiative. On the other hand, there is the real danger of rash fixation of standards on a level reflecting the lowest common denominator, resulting in “low-level” standards. Additionally, any further modification and development of standards, once brought under national or international legislation, is seriously slowed down and complicated.

<sup>7</sup> Vaupel, S. (2000) Legal Options and Barriers to Government Acceptance of the IFOAM Organic Guarantee System. Proceedings 13<sup>th</sup> IFOAM Scientific Conference. 586.

- no use of inorganic fertilisers; basic principle of organic production: recycling of nutrients instead of intensive input
- no use of synthetic pesticides and herbicides; basic principle of organic production: maintaining natural diversity on the farm area
- restriction of energy consumption (e.g., regarding aeration) as a general trend; de-intensification of operations, lowering of input
- preference for natural medicines; no prophylactic use of antibiotics and chemotherapeutics, no use of such substances in invertebrate aquaculture
- intensive monitoring of environmental impact, protection of surrounding ecosystems and integration of natural plant communities in farm management; focusing on the effluents of farms and the design of farm ponds
- processing according to organic principles; basic requirement for final products to be certified as organic.

#### 4. Development of standards

These general principles have to be harmonised with the characteristics of single species and culture systems (e.g., "pond culture of carp"). This is done by developing special standards for different areas of production and processing. The standards:

- serve as guidance for the producer willing to enter organic management
- serve as reference points for inspection and certification procedures
- inform the consumer in detail about the special quality of the product and the special conditions of production/processing
- enable the producer/processor to prove this quality in a credible way

The nature of organic standard development is that it is "open-ended"; new technical possibilities and new scientific insights are continuously contributing to this process. For successful implementation of organic production – even of the same species - in new regions, different technical, geographical, infra-structural and social conditions have to be taken into account as factors likely to modify standard settings. Therefore, organic standards are not written in stone but, as instruments of a dynamic process, always requiring input from as many sides as possible.

Only about five European organizations actually carry out certification of organic aquaculture products; world-wide, there may be another 3-6. Some more organizations have drafted standards during the last 1-2 years, demonstrating their intention to start certification in future (Table 1).

**Table 1**

Organic Aquaculture in Europe 2001; certification programmes, certified crops and state of standard development.

<b>Certification programmes</b>	<b>Certification of/Standards for</b>
BIOSUISSE (Switzerland)	Organic trout
DEBIO (Norway)	Organic salmon, trout
ERNTE (Austria)	Organic <b>carp</b> , trout
KRAV (Sweden)	Organic salmon, <b>trout</b>
Bioland, Demeter, Biokreis (Germany)	Organic <b>carp</b>
Naturland (Germany)	Organic <b>carp, salmon, trout, mussel, shrimp</b>
SOIL (UK)	Organic <b>salmon, trout</b>
TÚN (Iceland)	Organic salmon, trout, sea-bass

## 5. Technical aspects

Since organic aquaculture focuses on a very broad spectrum of technical issues, exceeding the frame of this overview, only three central and characteristic “organic solutions” to critical aspects in European freshwater aquaculture will be described:

- Sustainability of fishmeal sources

Dedicated fishmeal harvesting (i.e., catching and processing fish only for animal feed production) is not considered to be a sustainable management of natural resources, mainly because the effects on marine food-chains (aquatic mammals, sea birds, carnivorous fish) are not predictable and in most cases likely to be injurious. Therefore, organic standards focus on the use of trimmings of fish caught and processed for human consumption. Other acceptable (but not yet realised) alternatives would be the use of bycatches or local over-capacities of certain fish species, such as whitefish (cyprinoids) from European lakes. There are technical obstacles linked to such alternative fishmeal sources: in particular, the high phosphate level in trimmings has to be faced by adequate sieving-out of bone-particles, in order to prevent increased nutrient loads in the farm’s effluents. Additionally, organic standards prescribe, as far as possible, regional fishmeal sources, in order to do without the global protein-transfer, mostly from Peruvian and Chilean fishmeal factories to feed mills and aquaculture operations all around the world.

- Supply of organic feed (vegetable prime material in certified organic quality, no use of synthetic/artificial and GMO-derived ingredients)

In organic agriculture, this requirement does not offer major obstacles, since nutritional needs of common species can be fulfilled without formulated/pelleted feed, in most cases by the farm’s own production. In organic aquaculture (besides herbivorous species), the initiators of a new project (e.g., “organic trout in continental Europe” by Naturland in 1999) have to deal both with the pilot farm(s) and the feed factory from the very start. Today, a broad variety of vegetable feed ingredients such as soy beans, peas, corn, wheat and potatoes is available in certified organic quality at acceptable prices (i.e., prices that can be justified by the eco-premium on final products). However, supply of certain products (e.g., potato protein) still is far behind actual demand. Step by step, natural sources for antioxidants (e.g., biotin), carotenoids (e.g., Phaffia yeast) and non-GMO-derived vitamins could be identified and included in feed formulations.

- Fertilisation with organic material

While fertilisation with dung, compost and other organic material is a very common practice e.g., in tropical finfish and shrimp aquaculture, it has lost importance in European pond culture along with intensification. In organic carp production, there are limits for stocking densities and FCR (feed conversion ratio), so that it is necessary for the farm to develop and maintain an equilibrium between carp and terrestrial agriculture/animal husbandry, in order to provide adequate amounts of organic fertiliser. Given the case when a particular carp producer does not own agricultural areas, cooperation with other organic farms is recommended. The same applies to organic trout farms, which rely on agricultural areas for adequate sludge disposal.

## 6. Marketing aspects

### 6.1 Volume of organic aquaculture products in Europe

In Europe in 2000 there were markets for about:

- 4000 t of organic salmon (from Irish and Scottish farms to Austria, Benelux-Countries, France, Germany, Ireland, Switzerland and United Kingdom)
- 100-200 t of organic trout (from Scottish and German farms to domestic markets)
- 200-400 t of organic carp and accompanying species (from Austrian and German farms mainly to domestic markets)
- 100 t of organic blue mussels (from an Irish farm to Germany).

In 2001, organic shrimp (in a first step about 200 t from an Ecuadorian farm to United Kingdom) have entered the scene.

All the above figures are expected at least to double or triple during the next 2-3 years, based on current developments in organic aquaculture (farms actually interested in converting), as well as from general trends in organic markets: In a recent study, management of the 2-3 leading retail chains in five European countries expected a growth of 30–100 percent for organic turn-over in the next four years (Schmid *et al.* 2000).

### 6.2 Analysis of the organic food market in Europe/relevance for organic aquaculture

While data about marketing of organic seafood are still very scarce, a study on growth and development of the organic food market in 18 European countries was recently carried out (Michelsen *et al.* 1999<sup>8</sup>). Table 2 gives actual organic market share in relation to organic agriculture area share and some sales and policy characteristics. It is noteworthy that the recent development due to the BSE crisis is not considered here.

Even if market structure in European countries is quite varied and national organic markets have developed along different paths, the following main results can be drawn from the findings (which in important parts also apply to organic aquaculture products):

- Since distribution is a central parameter for organic market development, and the largest consumer segments are reached in supermarkets, the sales share of organic food in conventional supermarkets is an important factor for market development. Also for organic aquaculture products, it was an important achievement to become suitable for sale in supermarkets (trout and salmon in vacuum bags, shrimp pre-cooked and deep-frozen). Beside supermarkets, especially in Germany, there are various supply-chains for

<sup>8</sup> Michelsen, J., Hamm, U., Wynen, E. and Roth, E. (1999) The European market for organic products: Growth and development. Organic farming in Europe: Economics and policy, vol. 7, Hohenheim.



organic fish: direct marketing of fresh or processed fish (farm shops, weekend markets), subscription services, specialised organic and seafood shops.

- Low price premiums are driving demand. This only partially applies to organic aquaculture products, with consumers' price premiums generally exceeding 50 percent at retail level. Apparently, consumers tend to consider fish as a delicacy which "does not have to be cheap", given prior quality and informative value (Richter *et al.* 2000<sup>9</sup>) to justify the higher price. On the other hand, consumers of seafood are very sensitive about quality and, once disappointed by discount-priced average products, really search for alternatives and accept high premiums for organic seafood.
- (not in the table): There is no direct relationship between premiums paid to farmers and the price premiums charged in the shops because of highly fractionated supply structure. This also applies to organic aquaculture products, and is the reason for many producers to start more direct forms of marketing, e.g., by extension of their processing facilities.

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<sup>9</sup> Richter, T., Schmid, O., Vetter, R., Weissbart, J., Freyer, B. (2000) Reasons for the different structures of the organic market within the border regions of Switzerland, Germany and France along the upper Rhine Valley. Proceedings 13<sup>th</sup> IFOAM Scientific Conference. 526.

**Table 2**  
Organic markets in 18 European countries

Organic market share/country <sup>10</sup>	Organic agriculture share of total agricultural area in %	Consumer price premiums <50% <sup>11</sup>	Great importance of a generic label	Nation-wide professional promotion since 1993	Sales through conventional supermarkets >50%
<b>&gt;2%</b>					
Switzerland	6.70	+	+	+	+
Austria	10.12	+	-	+	+
Denmark	2.36	+	+	+	+
Sweden	6.46	-	+	+	+
<b>1,1 – 2,0%</b>					
Germany	2.60	-	-	+	-
Luxembourg	0.49	-	-	+	-
Finland	4.76	-	-	-	+
<b>0,5 – 1,0%</b>					
United Kingdom	0.34	+	-	+	+
Italy (?)	4.08	-	-	+	-
Norway (?)	1.16	-	+	+	+
Netherlands (?)	0.85	+	+	+	-
Belgium (?)	0.47	+	+	+	-
France	0.55	(?)	+	+	-
<b>&lt; 0,5%</b>					
Spain (?)	0.51	-	+	-	-
Ireland (?)	0.52	(?)	(?)	-	-
Portugal (?)	0.31	-	-	-	+
Greece (?)	0.19	+	-	-	-
Czech Republic (?)	0.57	+	+	-	-

<sup>10</sup> Average of the five most important products: vegetables, cereals, dairy products; potatoes and fruit.

<sup>11</sup> Similar average price premiums for Germany (67%), Italy (64%), United Kingdom (54%), France (53%), Austria (43%), Denmark (35%), with different average premiums for fruits and vegetables (60-70%), cereal products (31%) and cheese (20%) are given by Schmid, O., Richter, T. (2000) Marketing measures for selling organic food in European retail chains – Key factors of success. Proceedings 13<sup>th</sup> IFOAM Scientific Conference. 519.

- The full potential of the organic market is difficult to develop in the absence of generic labels and/or the absence of nation-wide professional promotion. This point seems not to apply to organic aquaculture, and also only partially to other products (Table 2: Austria, Germany, Luxembourg).
- (not in the table) One crucial point for market growth is supply, because consumers interest in buying organic food is at a very high level in most European countries. This also applies to organic aquaculture, where market demand has exceeded supply from the early beginnings in the middle 1990s. In particular, supermarket chains usually do not enter even a promising new product line if there is no guarantee for stable supply. Therefore, organic producers tend to form cooperatives, sometimes with their own trademark<sup>12</sup>.
- (not in the table) Government support for production is an important factor for market growth, as subsidies have an initial effect on supply. Subsidies, however, are not sufficient, if the structure of supply is not adapted to the structure of demand. Marketing problems with milk and beef have been caused by high conversion rates from conventional to organic farming in pasture/grass land, compared to conversion rates in arable and horticultural land. This applies only to parts of organic carp production, where government programmes subsidise extensive forms of management; a good pre-condition for organic certification. Other sources of subsidies actually are not known or unexplored. Conversion to organic aquaculture clearly is demand-driven, so that there is actually no reason for concern regarding oversupply in certain product groups.

### 6.3 Costs related to conversion to organic aquaculture

Costs related to conversion generally refer to:

- decreased production volume (e.g., lower stocking densities)
- increased production costs (e.g., organic feed, environmental monitoring)
- inspection costs
- certification costs, often in the form of membership and/or license (for on-product use of logo) fees

Whilst the first two points strongly depend on type and previous management of the farm, annual inspection costs amount on an average to 2-4 man-days for travel, physical inspection and report writing. Certification costs can either be fixed, or calculated as a percentage of organic sales with the organization's logo (commonly about 1 percent of net sale prices), or represent a combination of the two.

## 7. Conclusions

Technical, environmental and economic relevance of organic principles in European freshwater aquaculture can be listed as follows:

### Technical

- Increased product quality. Organic production, due to the extensive/semi-intensive management systems, has positive effects on important quality criteria, e.g., lower fat content and firmer texture in carp and trout. Furthermore, a traditional type of processing (no liquid smoke, no salting by injection) as prescribed by organic standards, is per se considered an indicator for premium quality.

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<sup>12</sup> e.g., German TEICHGUT - organic trout which was awarded the title "product of the year 2001" at BIOFACH, the international fair for organic products.

- Improved resistance status of fish even if European freshwater aquaculture as a whole is actually not threatened by major disease problems, experience in other sectors, especially tropical shrimp production, has shown that highly intensified systems are more vulnerable to epidemics. On the contrary, systems working closer to natural dynamics on a low-input level, in general are less susceptible to devastating outbreaks of diseases.
- High product safety since all input in organic production as well as the final product are subjected to a very intensive inspection and certification system, referring both to production conditions as to chain-of-custody, product safety is maximised. An objective of organic standards is to prevent poorly controlled or inadequate feed and fertiliser, as well as processing ingredients, resulting in uncontrollable effects on the final product. Relevance of this point was drastically proven by BSE, mainly a result of inadequate feeding concepts.

#### Environmental

- Intensive environmental monitoring organic standards prescribe a very intensive monitoring system regarding alterations of hydrochemical parameters by farm effluents. Because of the annual inspection procedure, there is a good opportunity for follow-up of protective measures.
- Reduced environmental input e.g., regarding nutrient loading of effluents
- Protection of aquatic and shore-line habitats; this general requirement is an intrinsic element of organic standards and is linked case-wise to site conditions, normally in coordination with stakeholders such as NGOs, scientists and local authorities.

#### Economic

- Premium products offer an alternative to intensification; actually many small or medium-sized fish farms face the alternative to intensify or close down, since they are under pressure from low prices paid for conventional products. Organic production, due to good margins, offers a highly attractive market niche.
- Stable contacts between producer-processor-market instead of “exchangeability” in the conventional sector, a producer is easily put under price pressure; in the organic context, due to it’s “concerted action” character, average duration of business contacts is much higher.
- Organic production as diversification of product range. Experience has shown that organic products show a highly positive effect of novelty, many times opening completely new marketing channels (e.g., introduction of organic white shrimp to UK supermarkets, so far not dealing with this species at all, or of organic carp to Switzerland, not being a traditional market for carp). Intense media attention to new organic aquaculture projects and products has clearly contributed to this desirable effect.

### **8. Recommendations**

In order to strengthen the positive impact of organic certification on European freshwater aquaculture, it is recommended:

- to increase the volume and diversity of organic aquaculture products in order to meet the high demand

- to encourage investments with incorporated environmental criteria, so that expansion without diluting the non-financial goals of the organic movement is made possible<sup>13</sup>
- to ensure a flexible development of regulations and laws surrounding organic aquaculture, in particular by further enforcement of private standards that are referenced by regulations, and by governmental acceptance of private accreditation systems (IFOAM)
- to meet the increased demand for research in organic aquaculture, e.g., by developing research partnerships between farms, certification programs and research institutes<sup>14</sup>.

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<sup>13</sup> Dollinger, J.D. (2000) Growing our industry from within: Meeting an aggressive demand curve with outside investment capital. Proceedings 13<sup>th</sup> IFOAM Scientific Conference. 536.

<sup>14</sup> Lockeretz, W. (2000) Organic farming research, today and tomorrow. Proceedings 13<sup>th</sup> IFOAM Scientific Conference. 718.

## Market trends and consumer attitudes

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### ABSTRACT

The author points to the difficulty of determining consumer preferences for fish products and with specific reference to northern Europe examines possible trends in product development from freshwater aquaculture. These are divided into tradition, exotic products, sophisticated food as an experience, ecology, health and convenience.

### A disclaimer

During the last ten years, I have often been asked to write reports for international organizations or private investors on consumption and market patterns for fish in Western Europe. As a scientist, my first response in all these cases has been to ask why they didn't choose a marketing economist to do the job. Often the answer was that: 'marketing economists don't know the difference between a minnow and a whale'. To them, it's all 'fast moving consumer goods'.

It must be acknowledged that fish consumption in Europe is a very complicated matter. It comes second maybe to the fashion business in complexity. Whereas the meat industry deals with ten or so species of animals, the fisheries industry is concerned with many hundred species at any given time. Consumer panels to study home consumption, organized by specialized companies have failed, until now, to produce reliable figures on home fish consumption. When the first results were released in Belgium, anybody concerned with the fish sector simply knew the figures were not correct. The consumption data did not match the production figures, and in spite of black markets and the grey fish trade, it is not possible to consume what was not produced. The reason has nothing to do with the inability of the marketing research companies. It is the consumer who is often incapable of recognizing the fish he/she bought. Frequently, they cannot recall the name of the species of fish, and then for the sake of convenience use the name of a more familiar fish. Even that does not account for the more illicit substitutions made by the distributors, fishmongers or cooks. As a result, there is much more cod or sole consumed than there is produced.

### A diversified market

There is no such thing as a European market for fish products, certainly not where consumer habits are concerned. As General De Gaulle once said: *"how can you maintain unity in a country that knows more than three hundred types of cheese?"*. There is no relation between the consumer preferences of the Portuguese mother of eight in rural *Tras Os Montes* and the young urban professional in Upsala. Allow me therefore to focus my observations on a slice of Europe situated somewhere between The Seine and the IJsselmeer, the part of Europe I happen to know best. The importance of the choice of this part of Europe is that perceptions of freshwater fish in this area are totally different from those in the more central North-South oriented part of Europe, including Germany, Switzerland and Italy. Here fresh water fish consumption seems to be much more of a habit. This part of Europe is also one of the wealthiest and accounts for some 50 million people.

Within a small country like Belgium consumer preferences regarding fish species or preparation may vary even from town to town. At first, it seems logical to learn that more sea fish is consumed in Flanders, the north of the country close to the sea, while in southern Wallonia more trout is consumed. With closer scrutiny the picture blurs: it is not the Southern Belgians who eat these rainbow trout, but more often Dutch and Flemish tourists visiting the Ardennes forest. On the opposite side, there is an important consumption of eel

around the River Scheldt in East Flanders. Here again this consumption is largely dependent upon gastronomic tourism and not at all on the local population.

The Netherlands, everybody knows, is a great importer of all types of fish. However, with the exception of herring, the Dutch barely eat any fish. The place of sale of a fish product is therefore rarely the place of consumption.

*Five fishmonger shops, located on the same street in the fishing port of Nieuwpoort in Belgium each average 1 t of fish sales daily. All this fish is bought by tourists when driving back to the hinterlands of Belgium and France. Belgians shop for fish in Dutch border towns such as Hulst, or in the Auchan supermarkets in France. Where does that show up in the national statistics?*

All this proves that there are as yet no reliable tools for doing serious research into fish consumption. Therefore beware of market gurus, they more often than not are doing bad science and usually tell you what you would like to hear. In the best case, they will produce a self-fulfilling prophecy.

So, since there are no tools to study the market in a scientific way, we should try some common sense, some experience in the matter and a 'wet finger'!

#### **How does the consumer look at freshwater fish?**

A colleague of mine once put it this way: "according to the young, fish is a white square piece of protein, without skin nor bones, and with a neutral taste that does not spoil the sauce. According to the old, the best fish is a pig (pork)!"

The perception about fish has changed a lot during the last thirty years. Up to one generation ago, fish was a poor man's fare. You ate fish because you had no money for meat or because you did penitence (Lent and Fridays). By fish, we here mean sea fish. In this part of Europe, with a very old history of industrialisation, freshwater fish became inedible or extinct ages ago. Burbot (*Lota lota*) disappeared in the Middle Ages, the catfish (*Silurus glanis*) from the twelfth century onwards (due it is thought to climatic circumstances). The last sturgeon in Belgium was sold sometime in the eighteenth century.

An anecdote in this context: a typical Flemish fish dish is called 'Waterzooi'. You can compare it to a matelote or bouillabaisse made from freshwater fish and flavoured with parsley root. As catches in the Scheldt and Leie decreased, the population of Ghent found it more and more difficult to obtain the necessary fish and started preparing the dish with chicken. Today "Gentse waterzooi" is a pure poultry dish.

Anyway, by the turn of the twentieth century, most freshwater capture fish had disappeared from the market, only the eel was available up to the 1960s. At present there is no registered commercial freshwater fishery in Belgium.

In the Netherlands, the picture is different with a distinct freshwater and estuarine fishery still in existence. Holland has larger brackish and fresh water bodies. This 'IJsselmeer' fishery produces perch (*Perca fluviatilis*), pike perch (*Stizostedion lucioperca*). The total yearly production is around 1 400 t, produced by some 200 fishermen. The catch is almost all exported to France and Spain. Perch and pike-perch are not appreciated on the Dutch market. The same applies to smelt (*Osmerus eperlanus*) is caught on the IJsselmeer and, again, exported to the South. Before the Dutch explored this 'new' export market, smelt was used as chicken feed. The most recent data are from 1992: 1 517 t.

*It is interesting to notice that consumption of Dutch smelt in Brussels was introduced by Moroccan immigrants, less than ten years ago (out of Rungis market in Paris). The clue is that smelt is naturally unknown in Moroccan waters.*

In Northern France, the situation is probably rather like Belgium, but with fishing activity and aquaculture concentrated along the Somme river.

Carp never really took on as a popular consumer fish (introduction of carp in Western Europe probably goes back to the early 14<sup>th</sup> century). Today the only market for this fish is in Jewish communities and in areas with Polish immigrants. There is some carp culture for restocking. The fish is appreciated as game by amateur anglers, but it is rarely taken home for dinner.

As a result the people of this corner of Europe have forgotten the utilisation of freshwater fish in the kitchen, with two exceptions: eel and trout. Trout, cultured in literally hundreds of small fish culture ponds all over South Belgium and the North of France is consumed whole fresh or as smoked fillets. Sophisticated products like mousses, terrines and trout caviar are finding their way to the market.

The other product is eel. Typically the consumption pattern differs between these three neighbouring countries. In Holland the traditional product is smoked (small) eel, in Belgium it is consumed mostly stewed 'in green sauce' (*paling in 't groen*). The Belgians rarely prepare this dish at home. They buy it ready-made from the fishmonger or find it in a restaurant. In France, the fish seems to be hardly appreciated at all.

### **The importance of food in household spending**

Sad to say for the gastronomic writer, spending on food, in relative terms, has been decreasing for most of last century. While around 1950 the average Belgian spent about 40 percent of their disposable income on food, this figure dropped, in last year's statistics to 14 percent. It was for the first time overtaken in importance by telecommunication. In other words, the young and wealthy now prefer (cellular) phones to food. Entertainment and travel had long since dethroned food as an important cash target. What happened? The distributors (supermarkets) have been putting the pressure on food prices for 35 years and the consumer grew accustomed to ever lower food prices. This liberated cash for spending in other sectors.

The capture fisheries could not follow this trend (fuel costs) but aquaculture had to, and we all know what happened to first trout and then salmon prices.

There is, however, a hidden side to spending on food. Eating outdoors has boomed in the last thirty years. According to statisticians, spending money in a restaurant is not considered spending money on food – it is called entertainment! Whoever frequents Paris or Brussels, knows that the people sitting in the *brasseries* and *bistros* around lunchtime are not there on a holiday. They just happen to prefer a restaurant to home made sandwiches.

Today, good staff catering facilities are more than ever a feature of the modern company. It is part of a non-salary payments system witnessed by the existence of schemes such as 'Ticket Restaurant' or 'Sodexo Pass' (you can find their logos on any restaurant door. It is a scheme where you're partly paid in –non-taxable –meal vouchers rather than money). Professional cooks are by far the best ambassadors of fish that dwell on this globe. As one chef whispered to me: "it takes six hours to make a *fond de veau*, but it only takes thirty minutes to prepare a *fumet de poisson*!" In lay terms, this means that it is much easier for a cook to make sophisticated fish dishes than to make meat dishes of the same quality. Fish simply works a lot easier. Along with that, as we will see, people love fish but find it difficult to prepare, so they will easily go for the fish of the day at the company cafeteria where they would never prepare it at home. Fish consumption in catering and restaurants accounts in Belgium (and possibly in France) for maybe half of all fish sales by volume.

### **Better image**

'Friday fish day' is now a thing of the past. With the health craze that started in the 1970s, fish consumption picked up in the wealthy West European countries.



At the same time, we see the consumption in the Iberian countries (still the largest fish eaters in Europe) is dropping. The same is happening in Japan. In countries where the consumption was traditionally high, fish is considered 'old folks food' and you prove your modernity and wealth by eating at Mac Donalds. This is not the case in Belgium where you eat 'Macdo' to prove you're too busy to eat properly.

The regions under consideration have doubled their fish consumption in the last thirty years. A lot was achieved through better quality standards in the fish industry: cooking sea fish in the 1960s used to be a smelly business. I also remind you that freshwater fish completely missed this development (except trout, of course). The number of popular fish species dropped steadily, as did the number of car brands. It was the era of standardisation.

The same happened to vegetables. Until the 1960s, the number of species the population relied upon for food had been dropping steadily since the sixteenth century (introduction of the American species). Recently, holiday experiences (Mediterranean and Asian cooking) and the organic movement brought back dozens of forgotten species as 'new' vegetables.

Today both volume and diversity of fish consumption are rising. This is in conjunction with the recent trends in consumer behaviour. In the last years we see a slowdown in volume growth, but a constant rise in spending. Fish, and especially sea fish, is getting very expensive. Danish cod is now at retail prices twice as high as average beef steak, or seven times the price of cheap chicken!

The perception of the consumer towards fish these days is as follows:

- a sophisticated food
- healthy
- expensive
- difficult to prepare
- not popular with children

I asked people I met last week (in Brussels) to list three freshwater fish they thought were excellent, and the answers were:

1. Don't know
2. Salmon (I didn't take that for an answer)
3. 'Omble chevalier' (meaning in this case both *Salvelinus fontinalis* or *S. alpinus*)
4. Pike-perch (they know it's good but have rarely tasted it)
5. Pike (mostly known under the shape of *quenelles*)

It is remarkable that nobody mentioned the eel, which they all eat. Probably the question made them think of 'real' fish, therefore omitting the poor snakelike creature. It is also possible they didn't really like eel but happen to eat it as a part of a yearly ritual, like Easter eggs or sauerkraut. I also remarked that they tried to avoid mentioning trout (too obvious and not fashionable). Absolutely nobody mentioned carp or catfish as being delectable! Some people mentioned perch. Most people knew freshwater fish from 'holidays in France' (as everybody knows, still the most popular tourist destination in Europe, if not the world)

### Trends

I cannot caution too much against trend watching, but the following relies on work that was done for the last SIAL exposition in Paris, from where I drew my own analysis. I have tried to relate all observations to potential freshwater fish products.

These are the trends in consumer products on the West-European market. They are based on the claims of any given product and its packaging, where the producers advocate a certain perception of 'quality' of their product.

### 1. Tradition

Tradition is a trend. A growing number of new products on the market promote themselves as being 'traditional'. It is therefore thought that the consumer will buy the product, *because* (but not necessarily *only because*) it is part of their tradition. It has often been said that new consumers necessarily want new types of food, but this is not always the case. Under certain circumstances they will be guided in their choice by the argument that a product is traditional. This not so strange, you have only to observe that other types of nationalism are growing.

For freshwater fish products, plunge in your old kitchen books and fish out your old national recipes: I give some examples:

- a. **"Paling in 't groen"** / "anguille au vert": stewed eel pieces in a green sauce including sorrel and other 'secret' herbs. Why don't we find this traditional dish in the supermarket frozen products shelf?
- b. **Escavèche**: from Wallonia / France, even Spain (ceviche). A very traditional way of doing a lot with a mixed catch of small lake fish: it's basically baked (whole) fish in a vinegared jelly. The vinegar is supposed to digest the bones. Where the produce is still sold (Chimay, Virelles), the river fish is now substituted by dogfish. Time for a modern comeback? A way of selling boneless pieces of freshwater fish.
- c. **'Gefilte fisch'**: every body knows it from the American movies but rare are the persons who have eaten it. A way of selling minced freshwater fish in the fish's own skin.

### 2. Exotism

Different parts of the consumer population will at different times be motivated by contradictory arguments. There is no monolithic market in front of us. The advantage for food products is that one country's tradition is exotic in another country. The demand for tropical or 'holiday foods' is growing. You will see in Brussels a growing supply of Asiatic supermarkets and curry shops. They do not cater for the ethnic migrant groups in the first place.

### 3. Fun food

Since food is slowly growing away from the dining table to casual snacks on the way to school/ dancing/ work, there is a niche for 'rave' food products. A certain form of snobbery on the part of the customer is always a help. Try horror movies as a source of inspiration. The Halloween theme has been growing constantly as a marketing argument. Visit Paris in October and you will understand what I mean. The disease is spreading fast to Brussels. In Amsterdam, they still have no clue how you can sell more food by painting cobwebs on the box.

### 4. Ecology

The green theme is a strong trend that is still expanding. Call it 'organic' or 'Bio' and it sells, regardless of the truth behind it. Though organic claims are now controlled by professional certifying bodies, the development moves towards the ridiculous. At SIAL last year, you could find organic versions of almost anything. I saw in Belgium bio-labelled disposable plastic coffee filters. This is possible because only the food ingredient is taken into account when labelling a product 'organic'. Also, organic does not necessarily mean healthy! I saw organic vodka at SIAL and people were talking about bio-cigarettes!

This trend creates great opportunities for aquaculture. In aquaculture input is controllable. Capture fisheries will never be able to get a green reputation. Further, capture is not certifiable under the terms understood in bio-labels so culture has a great advantage. Bio-salmon is already available, as are organic shrimps.

I must stress here that a bio-label, in most agricultural products, will give a competitive advantage for the near future only. In a few years time, it will be impossible to find certain vegetables and why not, salmon and trout, without organic certification. As Frank Tierenteyn, CEO of the Pieters group recently said: "...an industry cannot live by selling part of its production under a label, therewith claiming that the rest of its production is "second class". Either all of the production is going to be organic, or none of it. In the near future, all food that can will be organic."

There is a potential problem with aquaculture feed. In a few years time, there will be a shortage of fish oil and fishmeal for the salmon industry. Where is the raw material for aquaculture feeds going to come from in the future?

## 5. Sophistication

Can your product stand the neighbourhood of champagne?

The production of caviar (*Accipenser baeri*) is definitely growing in France, Spain and Italy. Sturgeon meat also has a great reputation in these markets but was earlier on barely available. At SIAL, it was shown that most new products advertise themselves as 'exclusive' or 'for the rich only'. This has probably a lot to do with the exploding middle class of Eastern Europe. A few years ago **Coregone** caviar (*Coregonus sp.*) from Canada, was shown on Belgian commercial TV as the *non plus ultra* of sophistication. **Gabriël** sells fish eggs of almost any fish. They also invested heavily in *terrines*, fish *patés* and other 'mousses'. The snobs shun the trout, they dine on **arctic char** that comes in wooden boxes with a pink ribbon around it. Some packers include the half bottle of Chablis in the box with the oysters or some vodka with the caviar. Think, when developing new products, of historical regal dishes.

Some new possibilities:

- lamprey** (*Petromyzon marinus*): an exclusive fish historically reserved for Royalty. Bordeaux and Fiumicino near Rome used to be two centres of lamprey consumption. Is aquaculture possible?
- Burbot** (*Lota lota*) liver: In France, *by law*, the liver of burbot had to be presented to the king.

Please also note that at ESE this year there was a distinct trend to mix products in a single package. For instance instead of putting 12 *zakouski* of salmon in one box, you put four with salmon, four with shrimp and four with scallop. Two of the four award-winning products were mixed products. A third was also a mixture, but of salmon with pineapple. That's called sophistication.

Finally, in this chapter: "*If you don't make enough money from your product, smoke it!*" It still seems to work. (e.g., smoked eel, smoked *Clarias* catfish)

## 6. Health

The consumer thinks food is the philosopher's stone and that taking the right diet could make him immortal! The inclusion of certain desirable ingredients in a food can make an excellent sales argument. Take fibre: when I was a student it was not considered a nutritional important food ingredient (indigestible carbohydrate), in fact it was never mentioned. Today you can see on the package of corn flakes, cookies etc. that 'extra fibre' is being added.

Fish has known an increased popularity because of the health aspects. Especially desirable for lots of reasons is the content of  $\omega$ -3 unsaturated oils. Fish seems to be excellent in preventing heart diseases. That is to say, marine fish are high in  $\omega$ -3, but fresh water fishes much less so. We have a problem here! Have a look at the nutrition tables. You will see the fat content in freshwater is not as positive as it is in seawater fish. At best, there appears to be a better level of vitamins in some freshwater species.

This can be helped in aquaculture by feeding fish with  $\omega$ -3 enriched feed, but the problem is, as I mentioned earlier, that the world is running out of industrial fish oil.

Another problem is dioxin content. This part of Europe is one of the most densely populated areas in the world and people have been lighting fires here since the last ice age. As a result, dioxin levels in the substrate are much higher than, say, in the Amazon forest. Nothing can be done to help it. The problem does not only affect fresh water fish. In Holland a warning was extended against eating wild caught eel. Aquaculture, of course, can control this problem, giving it a great advantage over capture fisheries.

## 7. Convenience

Herby Neubacher mentioned at this workshop: convenience is a strong sales argument, and the trend is still moving forward. To illustrate: If you come home tired from your work and still have to prepare dinner. What will you choose: potatoes or spaghetti. Chances are you will chose spaghetti because you don't feel like peeling potatoes. So spaghetti is more convenient. If a restaurant happens to be close by, you might choose not to cook at all, and put your feet under the table at your nearest Chinese. That's more convenient, but it's more expensive. Is it worth it? You will decide, according to your mood and your wallet. But convenience is a relative argument. Take a can of tuna. If you have no fridge, it's a very convenient product, if you have no can opener, it is not a convenient product at all.

Most forms of so called 'value added' production are in fact convenience products! Ready meals, pre-sliced fish, easy to open packages, boneless skinless fillets, you name it. The purpose is to lower the threshold for the customer to buy your product. At the same time you add value to your product, meaning the customer will be prepared to pay more because of a service you rendered him.

This does not mean there is no market for live and round fish, there will always be a market, and the more diverse a range of products is, the higher the chance that you will sell something. Remember: the customer does not always choose for convenience but also according to the other arguments listed above (tradition, exotism etc.)

Some specific convenience aspects of freshwater fish.

They don't smell like seawater fishes, as they don't contain TMAO (trimethylamine oxide).

Secondly, even a complete idiot is able to bake a filet of Nile perch or clarias. The texture is so that the meat doesn't fall apart when cooked. I myself consider this the greatest disadvantage of cooking fish. I don't mind bones, I consider them a natural attribute of the fish, but turning over the fish during baking is generally a disaster. Seafish is flaky. The fishes I just mentioned are not. This should be advertised! Get your television cooks to show this to the customer, let them try for themselves in the supermarket by having a baking session near the fish corner.

## Some conclusions

There are many trends and sales arguments in the market. The more diverse your range of product, the higher your chances of hitting a trend and increasing your sales. Try to recognize them and develop products accordingly.

Innovation of new products should best go through the food service sector. Fish is an ideal restaurant food. Chefs love to work with it, and customers prefer fish in restaurants because of convenience (they consider fish difficult to prepare, remember, and their kitchen won't smell). If you're active in a tourist area, be sure your local restaurants and hotels promote your fish. Happy tourists will take a liking for your fish species back home and they will sooner or later try to find it in their neighbourhood (exotism).

I have observed in the entire fish sector, that it is not the customer that makes the buying decision. Decisions today are made by the middlemen: the fishmonger, the distributor, the chef, the supermarket chain. Generally speaking there is always consumer resistance towards unknown fish species (what's the name of this fish? How do you prepare it?) How then do you explain that Nile perch conquered the Belgian market place in silence. *Lates niloticus* is obtainable everywhere as a fresh fillet. The answer is price. The creature was so cheap that fishmongers immediately knew they could make money with it. And so they did. I'm sorry to say the clearest trend is still: people will buy on price.

And, finally, remember: "make what you can sell, don't sell what you can make"!

**Which new products for aquaculture ?  
An analysis based on the study of the French market**

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**ABSTRACT**

An overview of French aquaculture production, followed by an assessment of new processed products from aquaculture that might compete successfully in the growing supermarket and fish delicatessen sectors.

**French aquaculture production**

The natural endowment of three coastlines with different structures (flat and sandy or rocky and denticulate), numerous rivers, coming from mountainous regions, and different climatic conditions (oceanic, mild continental and Mediterranean) has enabled France to develop one of the major European aquaculture sectors. At almost 300 000 t in 2000, this development has been based on a wide range of species and on a wide range of techniques.

Bivalve farming remains the most important activity accounting for 75 percent of the total volume and 60 percent of the total value of French aquaculture.

The second "traditional" activity is extensive fresh water farming in ponds, mainly of carp. It remains small-scale family managed and especially dedicated to operations of stock enhancement.

On the contrary, intensive farming of salmonids has been increasing thanks to technological improvements in artificial feed and in oxygenation devices. Of the total production 80 percent is for direct consumption (rainbow trout *Onchorynchus mykiss*) while the remaining is for stock enhancement for recreational fisheries (Fario trout *Salmo trutta*, Atlantic salmon *Salmo salar*). The main producing regions are by far Brittany and Aquitaine, but other farms are found along most of the French rivers. While intensive sturgeon (*Acipenser baeri*) and eel (*Anguilla anguilla*) farms have never been a success because of high production costs, sales of caviar from farmed sturgeon are successful and now make the activity profitable. Catfish (*Silurus glanis*) production is stable at around 300 tonnes a year, looking for recognition on the market.

Intensive marine fish farming (sea-bass, sea-bream, turbot, trout) increased at the beginning of the 1990s, after many years of stagnation due to the lack of reliable technology for the species adapted to the French climate. It has now stabilised with further growth being limited by the lack of suitable sites.

Fish farming accounts for 15 percent of the total value of fisheries and aquaculture in France and for 25 percent of the total value of fresh fish production (Table 1).

**Table 1**  
French fish farming production

	1999 Production (t)	1999 Turn-over (million euro)
Trout in race-ways (fresh water)	40 000	120
Extensive fresh water fish farming	12 000	14
Intensive fresh water fish farming (including caviar)	1 000	5
Marine fish farming (including fry)	7 000	70

Source : OFIMER

### The main segments of the French market for seafood

**Table 2**  
Breakdown of at-home consumption per category and recent trends

	Value (million euros)	Trend in volume 99/00 (%)	Trend in value 99/00 (%)
whole fresh fish	436	-5	0
fillets of fresh fish	825	1	8
other fresh products (crustaceans, molluscs, cephalopods)	731	-5	0
smoked and dried fish	412	-2	3
canned fish	702	3	3
frozen products	917	1	5
delicatessen and ready to cook products	361	13	14

Source Secodip

Only two segments have been increasing during the last years (Table 2):

- fresh fillets of fish
- delicatessen and ready to cook products

How is it possible for aquaculture products to target these two segments ?

After Japan and the USA, France is the third biggest market for aquaculture products. It relies especially on bivalves (mussels and oysters), crustaceans (shrimps) and fish (salmon, turbot, seabass).

Taking into account the main aquacultured species, it turns out that the deficit of the external trade for aquaculture is about 500 millions euros, i.e., almost a third of the French deficit in aquatic products for human consumption.

### The market for fresh fish in France and the position of farmed fish

The average apparent seafood consumption in France has been increasing at a slow but regular pace during the last ten years: 1 percent/year to reach 28 kg *per capita* (landed weight). Apparent fish consumption is around 12 kg *per capita* (landed weight)

As far as fish is concerned, 15 percent of the apparent consumption (fresh, frozen, smoked, dried or canned) in volume is made up of farmed products (Table 3).

**Table 3**  
Apparent consumption of fish in France in 1998 (t)

	Wild	Farmed
Production	444 894	63 916
Imports	849 521	127 479
Exports	313 183	20 317
Apparent consumption (landed weight)	981 232	171 078

Source OFIMER

The share of aquaculture products is more important in the market for fresh fish where it reaches 23 percent for at-home consumption and 27 percent for catering.

An in-depth transformation of market conditions is ongoing in France, along with other European countries. The most important issues are the increasingly dominant role of supermarkets in the distribution chain, the development of new processing techniques like pre-packed fresh fish, the growing importance of catering and the evolution of consumer behaviour.

The increasing market share of super/hypermarkets in European seafood distribution is a very important issue for aquaculture development. Indeed, fish farming has been focusing so far on the market for fresh seafood because of high production costs. Now, thanks to their well equipped fresh food counters, super/hypermarkets have proved to have positive effects on fresh fish sales in regions where fresh fish consumption was traditionally low. The burden of this opportunity is the obligation to comply with the specific requirements of the supermarkets. These requirements turn on supply regularity, availability of a range of products and homogeneity of characteristics for each type of product. It has to be noticed also that the increasing consumption of fresh fish in most European countries is due to steaks and fillets rather than to whole fish. In France for instance, fresh steaks and fillets have attained a 65 percent market share in the retail market in 2000 - more than 72 percent in the super/hypermarkets versus 52 percent in traditional outlets.

On the French market, there is a wide range of retail price for whole fresh fish with quite homogeneous qualities, from less than 4.0 euros/kg to more than 14 euros/kg. As for steaks and fillets, their distribution is much more concentrated in the range 10 to 12 euros/kg. The popular species are mixed and it appears that the name of the species is less important for steaks and fillets than for whole fish, since there is a limited number of available species and very little price differentiation between species.

At the present time, the position of farmed fish is very particular:

- As far as whole fish is concerned, farmed fish is either in the lower middle bracket (salmon and trout) around 5 euros per kilo, or in the upper bracket (sea bass, sea bream, turbot) more than 10 euros per kilo.



- Among fillets, the range is much narrower and trout is almost at the bottom of the price scale while salmon is in the core of the market. More expensive farmed fish are not sold as fillets.

There seems to be a large market potential for new farmed fish on the French market if they can be delivered in steaks and fillets at a retail price around 12 euros/kg. This means a regular production of fish from 1 to 3 kg at an ex-farm price under 3.5 euros/kg. One of the main advantages of this market is that an increase in production due to aquaculture would not have a major effect on the total supply in this category of product and would not lead to such price pressure as has been observed for seabass and seabream in the Mediterranean area.

#### **The French market for smoked fish, delicatessen and fresh ready to cook meals**

The market for smoked fish has now stabilised, after a decade of continuous growth. It is in a process of diversification and better segmentation, with the introduction of other species, in particular trout, tuna and swordfish. The market price is around 18 euros/kg.

The growing segment is the seafood delis and ready to cook fresh meals. It is here that innovation is more important, especially for aquaculture products.

Seafood processing in France can be qualified as a highly dynamic industrial sector as is the market for processed products. In the last two years a large number of new value-added products appeared on the French market, both from farmed products as well as from wild catches.

An analysis of new products from aquaculture has been carried out within the framework of an EU financed Concerted Action (Masmanap FAIR 98-3500). In France, the two main trends in the diversification of products from farmed species are the following :

- new processing, in all types of processing: different cuts for fish, pre-cooked seafood, ready-to-eat dishes, different types of smoking process, large range of products available from smoked salmon and trout, delicatessen, etc
- new packaging: development of fresh products under vacuum skin or modified atmosphere, and of easy to use presentations like individual portions, fresh or pre-cooked cuts, sold with the sauce separately, etc

The survey done in the main supermarket chains, and completed by the trade press, showed that the new products from farmed species are mainly found in the delicatessen self-service corner (or traditional corner), to a second extent in the self-service frozen cabinet and for a few products in canned form. The innovation in fresh uncooked products: cuts (fillets, steaks, etc), brochettes (kebabs), joint paupiettes, etc., is also worthy of mention. While the differentiation of products started several years ago for this group of fresh prepared products, they have been sold loose (in the traditional stall selling fish) or prepacked in self-service. The development of new packaging techniques (packed in vacuum or modified atmosphere), allowing better conservation, has encouraged the extension of the range to the self-service corner, which now includes minced fish, carpaccio and sushis.

These surveys show that a very wide range of new products, based on aquaculture species, have been tried on the French market in the recent past. It is noticeable that the new products are only based on the use of traditional farmed species (mussels, salmon, trout), available in large volumes, and at prices compatible with the preparation of value-added products. For salmon-based products, the processing industry uses only that species, or a combination of salmon and a white captured fish, the two colours allowing a nice presentation. No processing is observed with expensive species, as seabass and seabream.

### **The expectations of the economic actors concerning the future farmed species**

The results of an inquiry (MERO, IFREMER, 1999) aimed at understanding and comparing the expectations and requirements of the main actors of the fish chain, including processors, distributors, caterers gives an interesting image of the requirements concerning new farmed species:

For the supermarkets and for catering (chain restaurants and collective catering), the main criteria are: homogeneous white flesh (not greyish or yellowish), easy to carve fillets (good weight ratio), little odour and little taste, not expensive (same price level as salmon or cod). No problems with farmed fish, as long as regularity is ensured for supply and for product quality. Gadoids (cod) would be welcome

Domestic origin is not necessary, but traceability is important. Supermarkets look for fish around 1.5 kg, for fillets around 400 g. Catering looks for fish around 3.8 kg, for fillets around 900 g. Supermarkets prefer marine fish, but restaurants do not have a preference.

For the processors, it is important to find a fish that can be processed with the present processing equipment and technology. The criteria are roughly the same as for the distributors (white flesh, supply regularity), but processors look for lower price and are interested only in ready to use products (fillets). Robust flesh texture is important, as well as no bones but there are no requirements about fat content.

### **The image of farmed fish**

This issue has to be taken into account, all the more as the recent events about BSE and meat have shown that the image of farmed fish has been altered, with reduction of salmon sales.

The main results of a study carried out in 1999 show that consumers only acknowledge salmon and trout (with perhaps carp and perch), as farmed fish. This lack of knowledge does not mean that farming is rejected, but that more information about the farming process is necessary. Farming is not a major issue for most consumers. Only 20 percent of consumers are totally resistant to farmed fish (old people, in the countryside). They have no demands for further information. Eighteen percent are distrustful and prefer to buy fresh wild fish because it is available next door and because they can afford it (wealthy people on the coast and in Paris), while 32 percent are indifferent and will buy any fish, farmed or wild (average earnings). Fifteen percent are interested in more information (date, food) about farming and would trust it (young people) but only 15 percent are openly pro-farming (large families, low income, Paris) because of the price, the freshness, the availability and the quality control.

The appellation "farmed fish", rather than fish from aquaculture, is recommended because the latter sounds too scientific. Farmed fish should be positioned more cheaply than the wild equivalent. Communication must be focused on socio-economic values (cheap, gives jobs, protects the oceans, human aspect of farming) and on warranty about freshness, production process and sanitary control. It is important to take advantage of the possibility to indicate the date of capture and to use the official quality signs available for food products (labels, certification, IGP) while it is more difficult for wild products to use these criteria. This study has raised the necessity to communicate separately on each species, and about farming as a whole. Indeed, people wish to know more on each species, and about the farming process.

### **An European survey of the market for seafood delis and fresh ready to cook meals**

On behalf of OFIMER, a study has been carried on in 2000 in order to assess the present and potential European markets for seafood delis and fresh ready to cook meals. France and the UK are the major markets in terms of volume and diversity of products (Table 4). These two markets have the biggest potential of development. In other countries, shellfish or surimi-based salads are the major segment, especially in Spain and in Italy.

**Table 4**  
Panorama of European markets for fresh processed products

	Size (t)	Trend	Dynamic segments
Germany	33 000	+	salads, terrines, surimi
Belgium	8 000	+	salads and surimi
Spain	5 000	+	salads and surimi
France	47 000	++	surimi, ready to cook meals, delis
Italy	2 500	+	salads and surimi
Netherlands	3 500	+	salads and ready to cook meals
United Kingdom	40 000	++	ready to cook meals, sushis

Source : OFIMER / CFCE

#### Major issues about aquaculture and new products

This rapid overview of the diversification of aquaculture-based products shows a wide range of situation according to country. The UK and France show an important development of new products, through processing, presentation and packaging, mainly based on the well-established species such as salmon, trout, and to a lesser extent mussels. In other countries, the development of new products is limited.

Several factors can be examined in order to explain those differences:

- the characteristics of consumption and distribution of aquatic food products, and the share of farmed products in the market,
- the trends of food consumption in each country, notably the consumption of convenience food, and the share between out-of-home and at-home consumption.

A first question can be asked, when we look at the important development of surimi products on the French market: will farmed fish be able to become raw material for such processing? The comparison of sales prices of farmed products with the price of usual raw products for surimi (Alaska pollock), must then be done, taking into account the possible decrease of the production costs.

Another major issue is the image of farmed fish, which may differ from country to country. In Southern Europe farming has a poorer image than in Northern Europe or in the United States. A big effort in communication has to be made to ensure long-term success.

## **Impact on trade of environmental and health/hygiene legislation: a trade barrier**

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### **ABSTRACT**

International trade relations are faced with new priorities as a result of globalisation, which will make tariffs largely irrelevant as a means of trade protection. In future the key measures will be rules governing health and safety of fisheries products and rules to ensure that fishing and aquaculture are compatible with sustainable development. The presentation reviews the steps taken by the EC to adjust to the new conditions.

### **Introduction**

The present era is one of change and development in international trade policy as well as on the broader political front. Within the European Community and at international level decisions have already been taken, or are being prepared, which will impact significantly on the institutional framework for trade in fisheries products, including the products of European freshwater aquaculture.

The enlargement of the EU presents a historic opportunity.

- An unprecedented enlargement of the EU is about to take place that will see the further integration of the continent by peaceful means, extending a zone of prosperity to new members. In March 1998 the EU formally launched the process that will make enlargement possible. It embraces the following thirteen applicant countries: Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, the Slovak Republic, Slovenia and Turkey.
- This is an enlargement without precedent in terms of scope and diversity: the number of candidates, the area (increase of 34 percent) and population (increase of 105 million), the wealth of different histories and cultures and in many countries the existence of a strong tradition in freshwater fish farming.
- Third countries will significantly benefit from an enlarged Union. A single set of trade rules, a single tariff, and a single set of administrative procedures will apply not only just to the existing Member States but across the Single Market of an enlarged Union. This will simplify dealings for third country operators and improve conditions for trade.

Some other important developments of the institutional framework are:

- the entry into force of the Community's new common market organization for fisheries products last January. The part dealing with consumer information on the commercial designation of the species, the production method (caught at sea or in inland waters of farmed) and the catch area information will apply from January 2002;
- the launching in March 2001 of the debate on the future of the Common Fisheries Policy after 2002 by a Commission Green Paper which raises questions about the response of the European fisheries sector to globalisation;
- a New Round of multilateral trade negotiations in the World Trade Organisation (WTO) in which fisheries products will be included, will be launched at the Ministerial Conference in Qatar in November next.

From each of these sources new conditions for trade will emerge that will affect the businesses of freshwater aquaculture in Europe in the years ahead.

The underlying theme of this presentation can be summarised in two essential messages:

- The first is that the fisheries sector, including the freshwater aquaculture sector, must come to terms with the accelerating globalisation of international trade. It will have to rely on competitiveness, not protection, in order to survive.
- The second message is that an emerging "New Agenda" for international trade negotiations, dealing with the complex and sensitive issues of health and environmental protection, is becoming very important and will more and more have a large impact on businesses in the fisheries sector.

The chief barrier to trade in fisheries products up to now has been high tariffs, but the trend is for these to diminish further. In the WTO there will be strong political pressure for further tariff cuts from two sources. First, the US-led Asia Pacific Economic Community (APEC) has (with the exception of Japan) already committed itself to work towards the complete elimination of fisheries tariffs by 2010 in the next WTO Round. In addition, developing countries outside the ACP see fisheries as one of the few sectors in which they can benefit from greater international trade because of their natural advantages (resource availability and low labour costs).

Another reason why fisheries will be included in future tariff reductions is the Community's own negotiating strategy, already put forward in the preparation of the WTO Ministerial Meeting in Seattle, of pressing for a general, "across-the-board" approach to tariff reduction, with no exceptions. The EU is determined to reduce the "peak" tariffs in other countries that have resulted from selective protection in the past. But if the EU is looking for no exceptions to tariff reduction from its trading partners, it must follow a similar "no-exception" approach in its own tariff offers.

The Community will not, of course, agree to elimination of tariffs in WTO, and envisages a proportionate approach whereby different levels of protection for different products will remain (i.e., within a given sector, such as fisheries, some tariffs will remain higher than others). This will provide some flexibility to deal with particularly sensitive products. This is not going to happen next week. It is reasonable to suppose that the results of the WTO negotiations might begin to be felt in about five years from now.

Having referred to the changing institutional framework I will now look at the impact on trade of environmental and health legislation and assess to what extent this legislation is a barrier to trade. I will discuss:

- firstly, health regulations and their importance for international trade mentioning the high level of human health protection which is to be ensured in all Community policies and activities under Article 152 of the European Community;
- secondly, environmental regulations and some recent developments in this area.

### **Health regulations**

No one needs reminding about the political sensitivity of health regulations and their importance for international trade. Technological progress in product conservation and transport, combined with growing vertical integration of businesses at the international level, has made it increasingly easy for raw materials and finished products to cross the world. The fisheries sector is already part of this global economy. Almost 40 percent of world production is exported, with the EU, Japan and the United States providing the major markets for fishery and aquaculture products. The EU is increasingly dependent on imports for its fishery supply and currently accounts for about 34 percent of world imports; Japan accounts for about 28 percent and the US about 15 percent.

Public concern about healthy and safe products has intensified with the "food scares" in recent years, from the linking of BSE in cattle to Creutzfeld-Jakob disease in humans and ranging from the use of growth hormones in livestock production, genetically-modified organisms, to

the Belgian dioxin crisis. These have given rise to a major debate about food safety linked to international trade in food. At EU level the protection of public health became a higher priority than ever as a consequence of BSE as reflected in the reorganization of the Commission services in the food and public health areas. The establishment of the Food and Veterinary Office (FVO) in April 1997 was a key part of the response. Its mission is to monitor the observance of food hygiene, veterinary and plant health legislation within the EU and elsewhere and to contribute towards the maintenance of confidence in the safety of food offered to the European consumer.

Against the background of an increasing political focus on food safety and consumer protection the Commission adopted a White Paper on Food Safety in January 2000, which aims to achieve the highest possible level of health protection for consumers in Europe. The guiding principle is that food safety policy must be based on a comprehensive, integrated approach and the White Paper sets out a major programme of legislative reform to bring about better integration and updating of food legislation. In order to restore and maintain consumer confidence in food and to contribute to a high level of consumer health protection the Commission put forward in November 2001 a proposal for a Regulation of the Parliament and the Council laying down fundamental principles and requirements of food law and establishing a European Food Authority, which *inter alia* will be responsible for formulation of scientific opinions in the context of risk analysis.

For fisheries products, the Community has a clear policy. The European consumer has the right to be assured that imported fish and fisheries products meet the same health standards as those produced and subject to control in the Community. From July 1998 the same rules which have applied within the Community since 1991 for fisheries public health have been obligatory for imports and bilateral agreements between individual Member States and third countries have ended. For almost three years imports have only been permitted from a Community list of authorised countries (to be found in the Annex to Commission Decision 97/296/EC, as amended) having a system of legislation and controls equivalent to that of the EU. Under WTO rules the EU is entitled to set levels of protection so long as they are proportional and non-discriminatory. For aquaculture products the residue monitoring requirements of Council Directive 96/23/EC, which have applied in the EC, are currently being extended to imported aquaculture products.

A comprehensive outline of the EU system can be found in the overview papers of the report of the OECD Workshop on Seafood Inspection held in January 1998. A paper by Sophonpong and Lima dos Santos at the same workshop stated that the EU "may be standing on the verge of trade barriers in many occasions". The possibility of giving special approval to establishments in the absence of a competent authority was criticised; but this exception has never been used and it unlikely to be used in the future. The maintenance of the health certificate for fully harmonised countries was also criticised as was the fact that FVO inspectors for fisheries products are veterinarians; both of which are justifiable.

Apart from the EFTA countries which are part of the Single Market, there are 101 countries and territories on the Community list, the 56 on part one of the list are "fully harmonised" with Community requirements and the 45 in part two are listed on a provisional basis to permit bilateral trade to continue. The majority of the latter have been visited by the Food and Veterinary Office inspectors and many will move to the first part of the list once supplementary guarantees are received from the competent national authorities. In recognition of the difficulty of meeting the requirements to become harmonised the Council decided in December 2001 to extend the validity of part two of the list to 31 December 2003. No fewer than 55 countries, which exported fish to the EU in 1997, are no longer able to do so. The list is, however, open for new additions on an ongoing basis and these countries are eligible to go on the list once the necessary requirements are fulfilled. The EuropeAid Cooperation Office

is currently working on a proposal for a major technical assistance programme to assist ACP countries in this area.

The situation regarding the accession countries is that 11 are on the Community list; five are in part one (Czech Republic, Estonia, Latvia, Lithuania and Poland) and six are in part two (Cyprus, Hungary (for live fish), Malta, Romania, Slovenia and Turkey). Two are not on the list; Bulgaria (which was removed from part two following a mission by the FVO in October 1999 which found deficiencies) and the Slovak Republic. The situation for the ex-USSR is that Russia is in part one, and Belarus and Azerbaijan (for caviar only) are in part two. In the case of ex-Yugoslavia only Slovenia and Croatia are in part two of the list while neighbouring Albania is in list one. The Faroe Islands is in part one of the list and Switzerland is in part two at present.

Over the past few years the Community has removed three countries from the list following inspection missions. In addition, there have been a number of bans to safeguard against specific microbiological problems and control deficiencies in individual countries; India, Bangladesh and Madagascar in 1997, Uganda, Kenya, Tanzania and Mozambique in 1997/1998 and Turkey for freshwater fish and bivalve shellfish in 1998/99.

The protective measures concerning fishery products from Uganda, Kenya, Tanzania and Mozambique introduced in December 1997 because of an epidemic of cholera in East Africa were maintained for over six months despite criticism from the World Health Organisation that such restrictions are not justified on public health grounds. The ban was the subject of consultations under the Sanitary and Phytosanitary Agreement of the World Trade Organisation. Following a subsequent risk analysis exercise by the Commission it has been decided that such bans on fisheries products are not in proportion to the public health risk posed and that a different strategy would be adopted in future.

A ban on the import of freshwater fish from Kenya and Tanzania in April 1999, on account of fishery malpractice involving the use of pesticides in Lake Victoria, was lifted when guarantees were received that fish would be tested for absence of chemical contaminants.

The health rules for fisheries products are being updated as part of a recasting process for food hygiene legislation, described by Vamvakas (this Workshop). The 16 vertical Directives dealing with the public health aspects of food from animal products (introduced in advance of the Single Market in 1993) and the horizontal food hygiene legislation for fishery products will be incorporated into a set of four Regulations dealing with:

- the hygiene of food
- specific hygiene rules for food of animal origin
- rules for official controls
- related animal health rules for food of animal origin.

Following a proposal from the Commission last year, these are expected to be adopted by the Parliament and the Council next year to apply from January 2004. These Regulations will replace Council Directive 91/493/EEC laying down the health conditions for the production and the placing on the market of fishery products and its several amendments.

### **Environment**

There are quite exacting requirements under Community law for aquaculture operators in freshwater, ranging from environmental impact assessment (EIA) for large intensive fish farming projects to nature conservation requirements and to requirements relating to water quality standards (see Annex 3 of the Commission Publication "Aquaculture and the Environment in the European Community" ISBN 92-826-9066-0). These requirements apply only in the territory of the Community, although there is a trans-boundary element to EIA. The Community does not act unilaterally in terms of environmental regulation outside the EU,

the policy is to implement internationally agreed rules or to act in agreement with other organizations of states after consensus has been reached. In its third party submission to the Appellate Body of the WTO in the case "United States – import prohibition on certain shrimps and shrimp products", the EC advocated the former approach as opposed to unilateral measures, which may be less environmentally effective and more trade disruptive.

Where conservation measures are agreed at the international level, for instance, within regional fisheries organizations, the Community takes steps to ensure that its vessels comply with them. More than this, it is prepared to take retaliatory trade measures against third countries whose vessels do not comply with internationally agreed conservation measures. This was exemplified in 1999 by the Community ban on imports of bluefin tuna from Belize, Honduras and Panama whose vessels were ignoring ICCAT catch restrictions for bluefin tuna.

Community legislation exists to enforce the Convention on International Trade in Endangered Species and a new permit system was introduced for imports of caviar or sturgeon of certain strictly controlled species in 1997. While disruptive to trade this is necessary to protect species which are at risk.

A technical requirement in the area of labelling that may in the future become more important for trade in fisheries products is "eco-labelling", or the certification that a product has been produced in a way that does not threaten other species or the environment. This concerns capture fishing activities but aquaculture could be concerned downstream by a requirement to certify that feed ingredients come from eco-labelled fisheries, for example.

The Commission considers that, while the wish to develop eco-certification is legitimate, strict conditions need to be attached to such schemes in order to avoid them becoming unjustified barriers to trade. (The Commission's starting point is that eco-labelling systems should normally be voluntary, that is, not imposed by law. If a government nevertheless decides to make eco-labelling obligatory, it should align its requirements on criteria developed in competent international bodies, including, for example, regional fisheries organizations, rather than invent and then impose its own solutions.

We cannot agree with the idea that our trading partners should be free to enforce their own systems for assessing the "eco-conformity" of fisheries products in an uncoordinated way, as the US has done in the case of "dolphin-safe" tuna. This can only lead to confusion, disputes, extra costs for producers and the reduction of world trade. Those who advocate regulatory eco-labelling systems (which we think is a mistaken view) should do so through discussion at the international level with a view to implementing common, international solutions to these complex issues.

Voluntary eco-labelling systems are preferable to regulatory ones. They allow greater flexibility both to those who design the systems and those who have to comply with them, while still encouraging more sustainable fishing practices. Provided that such voluntary systems can ensure transparency and non-discrimination (for instance, by demonstrating that the criteria against which an eco-label is awarded are based on objective and measurable facts, that assessment is sufficiently independent, that the system is open to all interested producers and the consumer is informed about the meaning of the eco-label) then they should be recognised on the Community market. The Commission will soon issue a Communication to the Council and the European Parliament on a Community approach towards labelling of fisheries products.

Community legislation exists for organic products in agriculture but no legislation currently exists for aquaculture products. Due to the growth of public and private organic certification schemes in the Member States that differ considerably from each other, Community legislation may be developed in this area in the future. The issues of certification of ingredients going into feed manufacture is one area which is topical at present, in the context



of the temporary ban on the use of certain feed materials introduced by Council Decision 2000/76/EC concerning certain protection measures with regard to transmissible spongiform encephalopathies and the feeding of animal protein. The November 2000 opinion on dioxin of the Commission's Scientific Committee on Animal Nutrition, which recommended substitution of fish meal and fish oil from European sources by South American products, is also relevant in this context.

### **Conclusion**

To conclude this brief overview let me repeat what I said at the beginning.

The movement towards globalisation, which includes the fisheries sector, is leading inevitably to new priorities in international trade relations. Tariffs will become largely irrelevant as a means of trade protection. The key measures affecting trade in the future will be rules governing the health and safety aspects of fisheries products, on the one hand, and rules to ensure that fishing and aquaculture are compatible with sustainable development, on the other.

Freshwater aquaculture producers will have to integrate these concerns within their strategy, alongside more traditional "quality" concepts. They will have to pay attention to health requirements, not only on the farm, but in the production facilities of their suppliers. They will have to convince consumers that they not only guarantee a high quality product but that that product is sustainable in terms of the aquatic resources concerned and the wider environment. These are new and complex tasks requiring a new awareness, and, perhaps, new skills.

**Measures to find and promote new market outlets:  
how to raise the profile of freshwater species**

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**ABSTRACT**

The European freshwater aquaculture industry needs to increase consumer awareness and improve the image of the industry and of its products. The paper analyses the various prerequisites for improving the industry image through marketing campaigns and cites examples of other European initiatives in seafood marketing.

**Introduction**

A number of studies and reports testify to the dire straits of much of the European freshwater aquaculture industry. We have already here at this Conference heard several speakers list some of the specific difficulties faced by the industry and the problems encountered in areas such as distribution, product development and marketing in general.

The numerous problems are symptomatic and concern us all since they cast doubt on the long-term sustainability of the industry in Europe. These problems create barriers to growth and hinder the industry in reaching its full potential as a supplier of valued food resources, of employment and as a creator of economic wealth to its participants and to the community as a whole. On the other hand, they present opportunities for industrial players that manage to overcome the status quo and rectify some of the causes of the difficulties encountered, at least in their own specific businesses. However, we need to consider issues that go beyond those of the single economic operator and address the problems in a holistic industry-wide context. This must be pan-European and all-inclusive, taking into account the concerns of the operators and other industry stakeholders and also of the States, the European Community and the regulatory authorities, and not least, of consumers and the general public.

In this Conference, some of my colleagues have been asked specifically to address issues such as new species, product development, distribution channels as well as the general outlook for the seafood markets in Europe. I will therefore leave these issues aside and focus my attention on the profile and image of freshwater fish and the possibility of improving this in the mind of the food service sector and of the consumers. I will also take a look at how some other freshwater aquaculture producers such as the Norwegian trout industry and the Norwegian Seafood Export Council have organized themselves.

**Limited, but growing trade**

When studying international trade statistics one fact that stands out is that imports and exports of freshwater species are relatively small compared to total production volumes. There are of course some exceptions but as a rule most of the production is consumed domestically. There are a number of reasons for this, first of all the fact that transportation costs traditionally form a large part of total costs, and transportation over long distances does not justify the added expense. However, there are several recent examples where exports are on the increase. These include frozen trout from Finland and Norway to Japan, fresh tilapia from Africa to Europe and from Ecuador and Taiwan to the US, frozen catfish from Vietnam to the US, and fresh Nile perch to Europe from Africa. In all these cases, the market price has been high enough to defend the considerable cost of transportation. The high market price has been possible because of the attractive image of the product in the market place and its strong competitive position in the local market. This comes about because consumers find the product attractive with a good price-quality ratio and the trade finds the margins acceptable.

What can producers do when this is not the case? How can producers raise the image and highlight the strengths of their products? How can producers get easier access to distribution

channels and increase demand for their products from consumers? Not surprisingly, there is no easy answer to this and no single remedy. Any strategy aiming at an improved competitive situation for a product or for a producer must make use of a number of elements necessary for reaching the goal. It is beyond the scope of this paper to focus on all these elements but I will present some thoughts on strategies of raising profile and awareness.

### **Campaigns-part of a strategy**

Most often when we think of image raising and profiles, our thoughts go immediately to advertising and promotional campaigns aimed at the general public. This is, of course, only natural as we all are familiar with campaigns on television or radio, in newspapers and other written publications and now on the Internet as well, or out-of-doors on billboards as posters, etc. This type of campaign plays an important role in a company's strategy to increase demand for its product, either directly through highlighting the virtues of the product or indirectly through improving the image of the company itself.

However, raising awareness and improving the image of a product, a company or of an industry can also be aimed at those who bring the product to consumers; the distribution channels such as the retail chains or the food-service sector through food writers and associations of restaurant chefs.

In international literature, there are several cases in which the effect of marketing and advertising campaigns has been analysed, including both generic and brand specific seafood campaigns. Most people in the industry are quite positive towards generic marketing campaigns when asked about it, the problem is usually who is to pay for it! For example, as reported by Seafood Business<sup>15</sup>, in the US a clear majority of industry people interviewed about generic seafood marketing campaigns are positive but those that are usually called upon to fund them - processors and importers - are much less so. In fact, two-thirds of those opposing the creation of a generic marketing programme were importers.

Several studies carried out on the effect of generic and branded marketing campaigns for food products, conclude that generic campaigns have a positive effect that increases with the elasticity of the good in question. In other words, if the good is a normal or superior good (for which demand increases as consumers' income increase and demand also increases if prices are reduced) generic campaigns do have a positive effect on total demand for the product<sup>16</sup>.

### **A few words on elasticities<sup>17</sup>**

Elasticities are measurements that economists use to analyse the price sensitivity of demand and supply. The demand for any given good is influenced, not only by the prices of the goods and substitutes but, above all, by buyers' incomes. Income elasticity measures the responsiveness of the quantity of the goods demanded to changes in the buyer's income.

Short-term income elasticities are calculated for finite time periods and product prices are held constant. They normally refer to one particular product, but can also be calculated for a group of products. Income elasticities can also be calculated for longer periods of time, and for groups of products.

Most goods are normal goods with positive income elasticities, i.e., demand increases as income rises; negative income elasticities can be found for inferior goods. Thus, less expensive fish such as mackerel, saury and horse mackerel are considered inferior goods.

<sup>15</sup> Seafood Business, March 1999.

<sup>16</sup> Kinnucan, Myrland. Generic vs. Brand Promotion of farm products. In press.

<sup>17</sup> FAO SOFIA 2000, A. Lem

Long-term elasticities are lower in absolute value than short-term elasticities, perhaps because cheaper substitutes become available over time as technology changes and consumers' tastes and preferences for other products develop. When looking at international studies, it is clear that most historical income elasticities for fish products are rather low, showing a weak to moderate response of demand as income rises, although the relation is positive. However, there are large differences among countries and among species.

Calculating historical income elasticities is a relatively simple matter; predicting income elasticities is far more complicated, and the complexity increases with the length of period considered. In attempting to predict the income elasticity to apply to a 30-year prediction for fish, it would be necessary to consider, *inter alia*: food habits of the particular group of consumers concerned; the fact that prices will change (contrary to the normal assumption for elasticities); the fact that products are modified (and sometimes become different products); changes in patterns of consumption as disposable income increases throughout the period of consideration; the level of fish consumption already attained at the start of the period, and the fact that consumers will substitute less expensive products with more expensive ones.

### Studies on salmon and catfish<sup>18</sup>

The species that has received most attention is salmon. This is not too surprising given that the fisheries for Pacific salmon have always been among the world's most valuable fisheries, and that the most successful species in intensive aquaculture is also salmon. The first studies were carried out in Canada and the US, with focus on wild Pacific salmon and the potential competition from salmon aquaculture (DeVoretz, 1982; Kabir and Ridler, 1984; Anderson and Wilen, 1986; Bird, 1986). With the exception of Bird (1986), all these studies indicate that demand for salmon is highly elastic. However, it is worthwhile to note that DeVoretz found that the demand for canned salmon is substantially less elastic than the demand for fresh/frozen salmon.

Hermann and Lin (1988) estimate the demand also for Norwegian farmed salmon, and with the exception of the studies that target the Japanese market, the demand for farmed salmon is the main focus of most of the studies from the 1990s. Given the large number of studies of different markets with different methods, it is as expected that the elasticity estimates differ substantially. However, Asche (1996) noted that a general trend seems to be that demand for salmon is getting less elastic. This is also as expected given that the total supply of salmon (both wild and farmed) has increased threefold from the early 1980s, and that this has led to a shift down along the demand curve. However, Bjørndal, Salvanes and Andreassen (1992) also indicate that generic marketing has led to an outward shift in demand. The reported elasticities are averages for data sets covering most of the 1980s and parts of the 1990s, and that total value of the salmon market has remained fairly constant over the last decade. It seems reasonable to assume that the demand elasticity for salmon is quite close to -1 at the present time. However, the elasticity does vary by product form and species, and demand for frozen Pacific salmon seems to be inelastic (Hermann, Mittelhammer and Lin, 1993; Asche, Bjørndal and Salvanes, 1998). Catfish is the only other species for which aquaculture production has increased substantially over a period in which demand has been investigated to some extent. Since catfish was a low-value species to start with, its demand was not too elastic to start with. However, despite successful generic advertising, Kinnucan and Miao (1999) note that demand has become less elastic with increased supply, indicating a shift down along the demand curve.

<sup>18</sup> T. Bjørndal. Demand elasticities for fish: A review. In press

### **Generic marketing or branded marketing campaigns**

What are the implications of these findings for the possibility of launching generic marketing campaigns for freshwater aquaculture species in Europe? Although the author is not aware of any elasticity studies carried out in Europe on freshwater species, it is obvious that the range of products produced and sold is quite diverse. In all probability the consumer does not instinctively group the various freshwater species together but has separate perceptions of the different products such as trout, carp, eel, etc. At the same time, if these products are hurt by a low image and considered low-value species, we would suppose the elasticities to be quite low.

Based on the research quoted above on the different outcomes of generic and branded campaigns this would suggest specific campaigns aimed at raising the image of the brand or the product in the different markets. The way this could be organized would have to be settled at both local and pan-European levels. For example, domestic producers of trout already carry out EU-funded campaigns in most countries. Likewise, associations of fish farmers could run similar campaigns in other markets, for example on carp in Germany.

In any case, whatever the producers do to influence the consumer, if the product is not readily available where people buy their fish or consume their meals, a campaign will not have much of an effect unless combined with initiatives aimed at the retailers and the food-service sector. Campaigns carried out in Europe by organizations such as the Norwegian Seafood Export Council, the Alaska Salmon Marketing Board, Canada, BIM etc, all include activities involving food journalists, national associations of chefs, large hotels, opinion makers in general and key buyers among importers and the retail chains. This factor is of even higher importance when entering new markets where the average consumer is not familiar with the product and where the product must be first "pushed" through the channels rather than "pulled" by consumer oriented campaigns alone.

#### **Norway - its marketing activities<sup>19</sup>**

A good example of how to organize joint marketing efforts is provided by the marketing activities of the Norwegian Seafood Export Council.

Norway is one of the world's largest exporters of seafood, not the least thanks to its successful salmon and trout aquaculture industry. Although most of the trout produced comes from companies with combined salmon and trout operations, there are also producers that have specialised in trout farming, mainly for the Japanese market. The production and export figures for the Norwegian trout industry are as follows:

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<sup>19</sup> [www.seafood.no](http://www.seafood.no)

**Table 1**  
Norwegian trout production and export volumes and price

Year	Production (t)	Volume (t)	Value (1 000 NOK)	Price (NOK/kg)
1990	3 796	1 300	44 824	34.48
1991	6 500	3 418	112 237	32.84
1992	8 000	3 975	132 233	33.27
1993	9 000	4 706	155 834	33.11
1994	15 000	9 569	318 933	33.33
1995	14 000	7 497	245 879	32.80
1996	23 000	14 813	416 961	28.15
1997	33 491	22 049	599 028	27.17
1998	47 000	33 614	957 343	28.48
1999	50 000	35 138	1 258 587	35.82
2000		27 605	974 406	35.30

The Norwegian Seafood Export Council (NSEC) is the Norwegian seafood industry's combined marketing and information council. The aim of its operations is to increase the interest for and awareness of Norwegian seafood in Norway and the rest of the world. The industry finances NSEC's activities through a separate statutory fee on the export of Norwegian fish and seafood.

The Norwegian Seafood Export Council was established by the Norwegian Parliament on 1 July 1991 and its activities are founded in the Fish Export Act. The Council attends to administrative functions and is an advisor to the Ministry of Fisheries. The activities are entirely financed by the industry through statutory fees, and are governed by a committee that is chosen by the Ministry of Fisheries, upon advice from the organizations within the fisheries industry, to serve a two-year term.

Approval of exporters, dissemination of information to the industry and joint marketing of Norwegian seafood on both national and international levels are tasks imposed upon NSEC through legislation. As a marketing agency, NSEC helps safeguard the reputation of Norwegian seafood at home and abroad by means of active interventions and through proactive work. In addition, NSEC acts as a contact link between the education and research communities and the Norwegian industry in the marketing of seafood.

The Council's headquarters and administrative offices are located in Tromsø with local offices in Germany (Hamburg), France (Paris), Spain (Madrid), Brazil (Rio de Janeiro), USA (Boston, Massachusetts), Japan (Tokyo), and China (Hong Kong and Beijing).

NSEC's activities are concentrated in four product areas:

#### Marketing

The purpose of marketing is to increase the demand for Norwegian seafood. NSEC attends to the marketing of seafood products that the fisheries industry itself feels is correct to focus upon at any given time. Joint marketing under the direction of NSEC should function as support for the exporters' own sales promotions. Advisory marketing groups have been created for various product categories in order to ensure industry involvement. These

categories are salmon and trout, whitefish products (fresh and frozen products of cod, saithe, haddock, etc.), prawns, conventional products (wet-salted fish, dried salted fish, stockfish) and pelagic products (herring and mackerel).

#### Market information

NSEC prepares statistics and conducts market analyses for seafood. The recipients of this information are exporters and industry participants, and the goal is to ensure the best possible decision basis for the industry, the authorities and NSEC internally. The work is performed in close collaboration with industry participants, organizations within the industry, the authorities and Norwegian and international research and development environments.

#### Market access

One of the goals of the Norwegian fisheries industry is to have at least as good conditions of competition and access to central markets as its competitors. NSEC has set up a system whereby industry participants can collect information about import quotas, tariff rates and trade conditions in various markets.

#### Public Relations

Maybe the most visible activity of the Norwegian Seafood Export Council is the promotion of the various species in general and of salmon in particular. Salmon and trout from Norway are marketed as an integral part of the Council's activities through advertising campaigns in European and other markets, using a mix of television campaigns, billboards and printed advertising in specialised food publications and women's magazines. In addition, a whole range of activities focussed on the trade, such as in-store promotion, field trips for invited chefs and journalists, seminars for importers and wholesalers and active participation in international exhibitions. This is carried out through the international offices in close contact with the Norwegian industry, local importers and retailers and by using local advertising agencies. In addition, after the agreement on salmon between Norway and the European Union, significant funding is being used on generic advertising for Atlantic salmon, carried out jointly by Norway, Scotland and Ireland.

#### **BIM and Scottish quality salmon**

Similar activities are also carried out by other European salmon producers; BIM<sup>20</sup> in Ireland has marketing offices in Spain and France, and the Scottish salmon industry<sup>21</sup>, organized as Scottish Quality Salmon markets its salmon under the Tartan mark and has obtained recognition in France under the Label Rouge scheme. These producers also use their national trade missions and export promotion agencies abroad to carry out promotion activities on behalf of the salmon industry at home. These activities are all carried in close cooperation with the aquaculture farmers and export companies as well as being linked to the needs of their clients in the specific markets in order to get the maximum effect out of the funds.

Despite the funds available from Norway for generic salmon marketing campaigns in Europe it is a fact that funds available for promotion are very limited in the context of the total food sector. Nevertheless, experience has shown that targeted campaigns in individual markets do have an effect and not only increase awareness of the product in the mind of the consumer but also improve the overall image of the industry by highlighting the virtues of the product.

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<sup>20</sup> [www.bim.ie](http://www.bim.ie)

<sup>21</sup> [www.scottishsalmon.co.uk](http://www.scottishsalmon.co.uk)

### **Freshwater fish campaigns**

Similar campaigns should be carried out for freshwater species on both national and international levels. A prerequisite to this would be the presence of strong national associations of freshwater fish farmers, either as separate organizations or under groups of the national fish farmers organizations. This is essential because part of the funding would have to come from the industry itself or from central funds to be spent promoting the industry and its products. In most countries, such associations already exist but where the strong institutional networks are yet not operational, campaigns will also be difficult to carry out.

The effect of promotional campaigns for freshwater species would be to increase demand for the specific product through increased awareness among consumers as well as raising the overall profile of the product and of the industry. In other words, the likely effect would be to cause an outward shift in the demand curve.

### **Concluding remarks**

Promotional campaigns are necessary to improve the image of the European freshwater industry and to raise awareness among consumers. The promotional campaigns should be part of an overall strategy aimed at increasing the profitability of the industry and the economic well-being of the operators. The industry's positive contribution to the rural economy should be emphasised and development programmes for alternative or supplementary economic activities, such as recreational fishing and agrotourism, drawn up. Likewise, the use of specific labels denoting geographic origin, traditional production methods or other parameters should be promoted.

Research into the commercialisation of existing under-utilised species should be encouraged, and more market research carried out to link the demands of retailers and food-service to the freshwater aquaculture industry. Lastly, more economic research into the demand of freshwater species in the European markets should be undertaken in order to improve understanding of how consumers respond to changes in income and prices.

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## Nile Perch: a competitor for European inland Aquaculture

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### ABSTRACT

The strong growth of a substantial trade in Nile perch from Africa offers significant competition to the products of European inland aquaculture. The paper offers an overview of the current market situation for Nile perch in Spain, Italy, France, Holland, Belgium and Germany.

### Source

The Nile perch of European commerce comes from Lake Victoria, the largest lake in Africa, bordered by three East African countries, Kenya, Tanzania and Uganda. Tanzania (49 percent) and Uganda (45 percent) have the major share of the surface area, while Kenya has the smallest part (only 6 percent).

Lake Victoria is the source of the river Nile, the longest river in the world. The river changes its name several times in its course. From Lake Victoria to Lake Albert it is known as the Victoria Nile, while from Lake Albert to the Uganda border as the Albert Nile.

### Product

Nile perch (*Lates niloticus*): Nijle baars in Dutch, perche du Nil in French, Victoria barsch filet in German, perca del Nilo in Spanish and persico del Nilo in Italian, belongs to the family of Groupers. It is characterised in having two dorsal fins of which the first is hard and spiny and the second has soft rays.

Nile perch was first introduced to Lake Victoria in the 1950s. Due to its ecological tenacity, it now accounts for approximately two-thirds of the lake's total harvest, with the prospect of a virtually continuous supply. The species is the largest freshwater fish in the world. Thanks to its biological tenacity and the ideal climate conditions it can grow to more than 230 kg. However, to assure tenderness and low fat content only fish below 23 kg are used commercially.

Even if the species of fish is the same, there are objective differences in quality between the three countries. Tanzania has the better quality, perhaps due to the fishing grounds.

This fish has a good flavour, firm texture, and is highly nutritious. It is virtually odourless and retains its high moisture content when cooked. It has a high Omega 3 fatty acid content, which research has shown to reduce the risk of heart disease.

### Market

This fish is now marketed frozen and fresh. In the early 1990s it was marketed only frozen in fillets and headed and gutted. In the last 3-4 years, due to more efficient production and transport facilities, Nile perch has become very popular as fresh fish, mainly because of the constant supply and good price levels.

As very often happens with new items in the beginning, this fish was sold under various names. In Spain it is still known (despite having the correct scientific and commercial name on the label) as mero (grouper). In Italy in the past years it entered the market as tilapia - a more valuable fish.

So far, these commercial tricks have been possible only for the fillets, as it would be very difficult with the whole fish due to a very different morphological shape of the species involved. As a result of a continuous demand for boneless fresh fillets, initial imports to Europe of fresh fish were made in small parcels, as a complement to frozen shipments, which because of the easier transport remained the most important market form. The fast growth of

the demand of fresh fish caused many problems in quality due to the fact that before the EU ban (definitively declared in March 1999) many factories were not able to produce the fresh fish in a proper way.

One of the problems was that the frozen fillets are deep skinned, while the fresh fillets are light skinned. A second aspect is that in the fresh market a dark pink colour is preferred and this is only obtained after rapid cooling. Early shipments arrived in Europe with the boxes full of water, at a temperature of +4°C, while the market only accepted the product iced (like the flat fish arriving from Holland). The bad quality and the lack of bacteriological control caused many problems and the ban from Europe (that started in March 1999) was a logical consequence. The first ban was due to Salmonella, the second due to the presence of pesticides in the lake and the fish. During that period a substantial improvement of the factories and the production system was achieved (mainly by controlling the temperature of the fillets with plate and blast freezer). The ban was lifted in February 2000 for Tanzanian products, with Uganda and Kenya respectively a few months later. We can now consider that the fish is on the market within 48 hours of production. After more than one year from the lifting of the ban it is possible to say that the logistics are well tested and are, without doubt, the key to commercial success.

### **Logistics**

The product is processed and packed in polystyrene boxes of 6 kg labelled and taped with different colours depending on the size. The temperature of the fillets is around -1,5 C. The most current commercial sizes are 100-400 g and 400-700 g. The fish is trucked to the airport (Mwanza for Tanzanian Nile perch, Entebbe for Uganda and Nairobi for Kenya) and is loaded on planes direct to Europe. The most important airports are Ostende in Belgium and Frankfurt in Germany. From these airports the fish is directly loaded on trucks and delivered through the different distribution platforms serving the different European markets.

Generally speaking this trading market is in the hands of Dutch companies. This is due to two main reasons: the first is the very strong tradition in the fish trade of the Dutch; the second, well organized logistics and the strategic geographical position of Holland. This allows the traders to change the destination of the goods very quickly, towards markets that may be better at that specific moment.

The most important markets in Europe are (in order of consumption) Spain, Italy, France, Germany Belgium and Holland for the fillets and Portugal for whole Nile perch.

#### **➤ Spain**

Spain is without doubt the leader in Europe in consumption of fish. The tradition of fisheries is so strong that the Spanish fleet is still Europe's largest. Mercamadrid is the second largest market in the world despite the fact that it is more than 800 km from the sea. The second market is Mercabarna in Barcelona. Valencia MercaOyarzun in the Basque country, Zaragoza and Vigo are the other main markets in the North. Granada Malaga and Murcia in the South are served from Madrid and Barcelona. Mercabarna also delivers fish in the south of France.

For fillets we can assume that Spain is the most important market for Nile perch in Europe with an estimated consumption of around 150 t per week

The main selling days are Monday and Wednesday, although the market distributes the fish every day. Mercamadrid is the only market in Spain that is also open on Sunday night. The market in Spain is characterised as being very unstable despite the big quantities that this country consumes.

It is very difficult to forecast exactly the weekly quantities because it depends also on domestic catches of fresh fish that are available in certain periods. This means that the market is often short or in surplus, which fact can have dramatic consequences on price levels.

Although the market is very competitive, quality has prominence over price. The demand for small fillets is very high.

These fillets are mainly sold through conventional markets. Supermarkets are very important in promoting the fish but they mainly buy from Spanish wholesalers. The rest of the fish is sold in the catering sector.

In the context of this market it is also important to note some special features of the Portuguese market. In Portugal fillet consumption is marginal, headed and gutted fish is very popular. Portuguese people love the steaks and they use the whole fish for this purpose. The estimated quantity is around 25 t per week.

The commercial sizes are 2-4 kg and 4-8 kg. The boxes are in general of 15 or 20 kg.

#### ➤ **Italy**

In contrast to Spain, the logistics and distribution of the Italian market is influenced by the Dutch market for flat fish. That means that there are only two days available for distribution: Monday and Wednesday. This peculiarity is also due to the fact that the traditional markets in Italy are very small and do not have the importance of those in Spain or in France. The total of Milan, Rome, Venice and S. Benedetto (mainly for domestic catches) only approximates the throughput of Mercamadrid.

In the last months there has been a trend for the distribution of Nile perch to become independent from the two traditional days. This is due to the fact that, for the first time Nile perch can be sent directly to Italian airports. For the time being, and for different reasons, not many importers have used this opportunity, but in the short term it could open up a different scenario, with the possibility to have fresh fish on the market every day.

The Italian market is more stable than the others and is, in general, ready to pay more. The quality is a very important issue, as the market does not accept bad products at any price. As in Spain, it is very difficult to sell big sizes.

Estimated consumption is 120 t a week

#### ➤ **France**

The two important markets for wholesale only are: Rungis - a nightmarket that delivers mainly to Paris and the surroundings and Boulogne - a daymarket, which delivers all over France

Other important markets, served mainly from Rungis and Boulogne, are: Lorient, Marseille, and Nice. Lorient works with Boulogne. Marseille/Nice buy in Boulogne and Barcelona. Central, eastern, and western areas are served by Boulogne.

Estimated quantity is around 100 t per week in France due to their organization supermarket chains are very important. They can import directly or indirectly. Because of the potential of this market, there is tough competition. Prices are offered from all directions and everybody wants to have a share. The main reason for this is the acceptance of the bigger fillets. The fact that the French are willing to buy "old" fish for a special price also brings down the price. They are not too critical about quality. Of course they want to have the best quality, but price is more important.

The market is changing quickly: small companies disappear, only the bigger stay alive. People are quite aggressive and as everybody is very aware of what is going on (transparent market), lying is useless. The acceptance of the product is good and stable. In the long term the very low price could represent a real problem for the traders and for the producer also.

### **Northern European market**

The northern markets are not really fish-eating countries (except Belgium), so fish is not a fixed item on the household menu. If they eat fish it would be flatfish, salmon or cod. Nile-perch still has to make its name with the end-consumer; an important target that will still take a couple of years.

Nile-perch is a fish that is always available and as the price is very reasonable it also is a good product to use in half-fabricates for catering and supermarkets. This makes up in a large part for the loss of markets in direct fresh sales. Nile perch is also used as a replacement for North Sea fish, like cod or red fish when there is a shortage on the market.

#### **➤ Holland**

The Dutch market is not a home-market, which means that approximately 80 percent of all the fish bought by Dutch companies will have a end-destination outside Holland. Holland exports mainly to Germany, Belgium, Northern France, Italy and Spain. Total domestic sales for Nile perch will add up to about 20 t per week.

#### **➤ Belgium**

Belgium is a good consumer as well as an exporter. The main export is to Northern France. Total sales of Nile perch can be up to 30 t a week.

#### **➤ Germany**

Although Germany is not really a fish-consuming country, the quantities imported tend to stay in Germany. Only very small quantities are re-exported. The export that takes place is in the northern part to Denmark, and in the southern part to Switzerland and Austria, but again the quantities are very small.

Total sales of Nile perch are approx. 40-60 t a week.

## **Competition between European aquaculture products and international food markets (pork, poultry, etc.)**

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### **ABSTRACT**

The paper compares fish and meat consumption in the EC and Eastern Europe and demonstrates significant increases in demand in Eastern Europe as a result of economic development. It concludes that aquaculture has the potential to be a major source of protein in competition with poultry.

### **Trends in food consumption and trade**

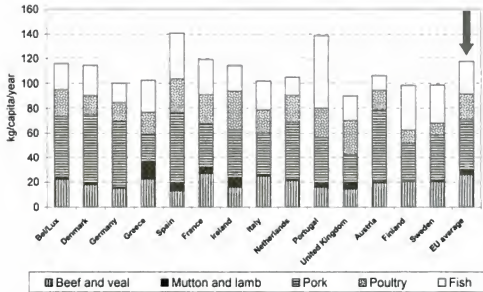
During the last decade the economy in Europe grew by an annual 3-5 percent. The expected economic and social development in the coming years will no doubt result in further increases in food consumption. Although this development includes significant regional differences between EU member states the differences are more obvious between EU and non-EU countries, in spite of the gradual development in the Eastern European region.

There have been significant changes in the food market, such as the increasing dominance of chain stores and hypermarkets, and in the purchasing behaviour of consumers. Today many households purchase food items only occasionally – weekly, fortnightly – but in greater quantities. Besides, there are higher expectations of the quality and packaging of products. The increasing preferences for processed food, with higher added value, is also a clear tendency. Health aspects also play a more important role in consumer choice, and a growing segment of consumers is interested in organic foods.

There have also been seasonal changes in consumers' behaviour. In summertime they pay more willingly for products contributing to the pleasure in their holidays and free time. These products include fresh meat products for the "barbecue season". The demand for "seasonal" products will increase, which provides opportunities for the producers.

Analysing consumer behaviour it seems obvious that more and more consumers have turned their backs on canned products and prefer the fresh and frozen (kitchen-ready) food products. This behaviour is based on the perception that the canned products are "low-value" food items. However, canned products have also lost their role in substituting fresh food items. At the same time the price increase of canned products has been at a lower rate than that of the average price increase of foodstuffs, due to the fact that this group of foods has the largest number of brands.

There is a major strategic role of meat and fish among foodstuffs, being important sources of animal protein. The most common sources of animal protein are raw and semi-prepared meat products. However, the preference of various meats is quite different and is influenced by several factors. In almost every region of Europe certain meat dishes are considered traditional (e.g., Serrano ham in Spain; beefsteak in the UK; sausages in Germany; etc.). Excluding fishery products meat consumption is highest in Spain (140 kg/capita/year), and lowest in Finland (62 kg/capita/year) among the EU member states (Figure 1). In total meat consumption Spain and Portugal are in first place (140 kg/capita/year) but the level of meat consumption in other EU member states is quite similar (100 kg/capita/year).

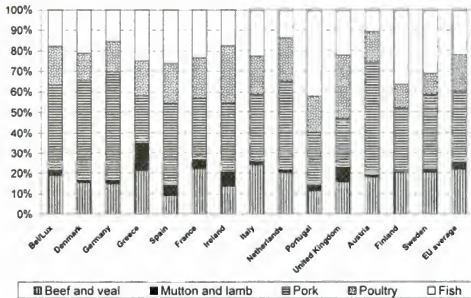


Source: Statistical Office of the European Community, MLC

**Figure 1.** The structure of the annual meat consumption in the EU (1997)

With regard to the proportion of different meats in the total average meat consumption in the EU, beef and veal represent 20-22 percent, mutton and lamb 3-4 percent, pork 34-35 percent and poultry about 17-18 percent. Fish and fishery products amount to approximately 22-23 percent (Figure 2.). However, there are significant structural differences between the average figures of the EU and those of the member states, such as Portugal, Denmark, Greece, etc.

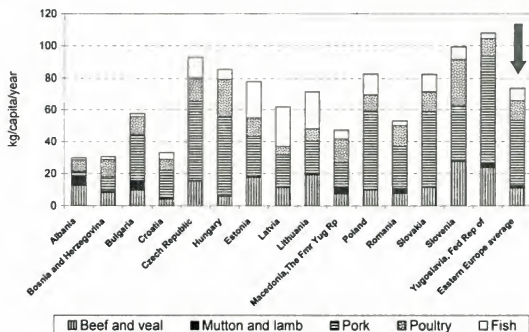
The foot and mouth disease and BSE scares have considerably restructured the meat consumption pattern in Europe. Due to this, beef and veal consumption has decreased significantly as well as that of pork, however to a lower extent. As a result of this, poultry consumption has increased considerably, as has fish consumption, but this is not so obvious.



Source: Statistical Office of the European Community, MLC

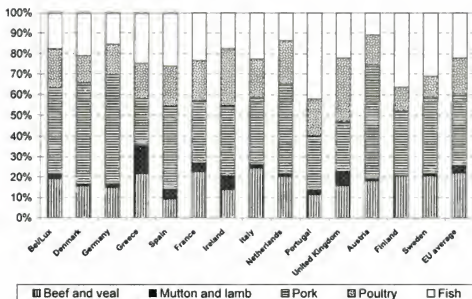
**Figure 2.** The annual meat consumption in the EU (1997)

The average total *per capita* meat consumption in Central-Eastern European countries is below the average of that in the EU member states by 45-50 kg and shows considerable differences between countries and social classes (Figures 3.and 4.). In the relatively wealthy countries this amount is higher and could increase further after the accession of these countries to the European Union.



Source: Statistical Office of the European Community, MLC

Figure 3. The annual meat consumption in Eastern Europe (1997)



Source: Statistical Office of the European Community, MLC

Figure 4. The structure of the annual meat consumption in Europe (1997)



The most important trends in European food consumption can be summarised as follows:

- As the income of the population increases the food consumption also increases in amount but more significantly in quality and value;
- Parallel with the improved income and social welfare of the population the need for processed food is also increasing;
- Expenditure on food is significant in the family economy. Its share in the total family expenditure is 30-40 percent in the EU and 45-65 percent in Central-Eastern European countries;
- In Central-Eastern European countries the demand for canned products has been decreasing;
- The consumers of the canned products are people living in the countryside and poor urban areas;
- As a result of increasing incomes, consumption of cereals, animal fats, fresh milk and potato (inferior products) is decreasing;
- Health aspects of foodstuffs are becoming of prime importance (unsaturated fatty acid content, high level of protein, minerals, trace elements, and low energy);
- As a result of increasing incomes there is a greater demand for eco-labelled and organic products and a so-called "green" segment of consumers is emerging;
- Basically there are two kinds of consumers in the European food market. One, which prefers products of a higher quality and is ready to pay more, the other is sensitive to the price and accepts cheaper products.

Today, the rapid process of globalisation of the retail food trade is taking place all over Europe, including the Central-Eastern European countries. The leading food trade companies are expanding their operations partly by purchasing existing trade units in other countries, and by new investments ("green field investment"). The growth of competitors and their market expansion also encourages trading companies to invest more and more. The influence of hypermarkets is increasing; however, small-sized food shops with traditional operation systems still exist in many regions, though with continuously decreasing turnover.

In Central-Eastern European countries the improved marketing and quality of packaging techniques can be emphasised as the most significant market change in the past few years. Based on our observations consumers like trying new products – as brand loyalty is not common in Central-Eastern Europe – so it is not uncommon that a number of companies introduce new packaging annually or every six months. This is not always an advantage for traders and retailers, because these innovations are rarely essential changes in the product. External innovations have an effect on market share of different brands but the size of the market does not increase.

In the last decade significant changes have taken place in the judgement of quality from the producers' and users' point of view in Europe. Nowadays one of the most important requisites for getting into and staying in the market is to produce quality products which meet consumer requirements as well as to operate and certify a quality insurance system. The development is well represented by the fact that the number of 9000 certificates given by ISO doubles year on year. In the second part of the last decade, following the ISO 9000 series, the introduction of environment oriented (ISO 14000) and job, health safety and security (BS 8800) control systems have begun. In the future businesses, the ones that manage to implement and certify the three systems together will gain advantages, because they can more easily dominate both domestic and export markets.

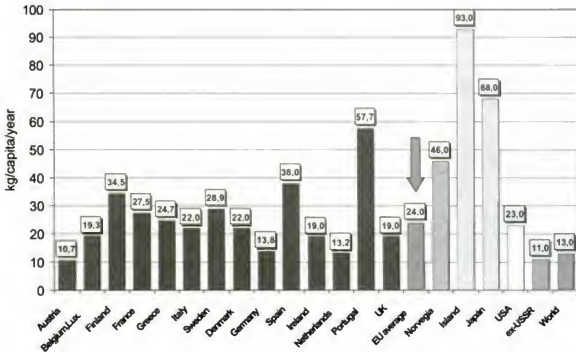
The most important tendencies of European food trade are summarised as follows:

- The concentration of food trade is increasing, especially in cities, which means that the market share of hyper- and supermarkets is growing, while the share of smaller businesses is decreasing;
- Besides producer brands there are an increasing number of labelled products of hyper- and supermarkets;
- Hyper- and supermarkets have new requirements for continuous supply of food items of stable quality in small amounts. Because of small amounts of stored products, there are new additional costs of trade (extra cost of displaying the product, advertising cost, discounts, etc.);
- Hyper- and supermarkets pay regularly but their terms of payment are 30-90 days;
- Product images are changing frequently and there is a high level of product differentiation;
- The role and market share of market halls and traditional market-places are decreasing;
- There are higher quality requirements for all products;
- The role and importance of quality brands and certificates is increasing;
- Hyper- and supermarkets are paying less and less for products;
- The level of food safety is continuously improving;
- Quality and food safety become an important factor in competition, which subdivides the group of suppliers;
- The biggest return from food sales is derived from consumers in the middle class;
- Volume of food trade is decreasing in city centres, while the number of drive-in-shopping centres increases.

#### **Trends in fish consumption and trade**

There are many factors that affect fish consumption habits. The most important are: prices, traditions, popularity, fashion, availability, personal factors, advertising, packaging, and family habits. It is obvious, that consumption habits and consumer behaviour are formed in a complex multi-factorial system. It can also be stated that most people in Europe are not averse to consuming fish products.

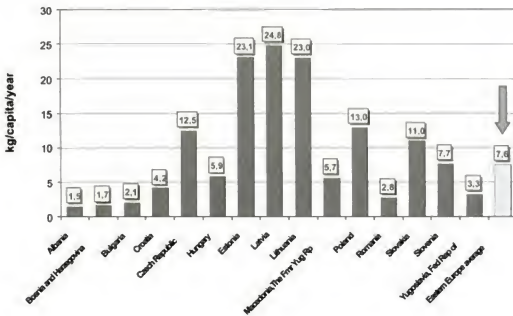
The average yearly fish consumption in the EU is 24 kg/capita, while the world average was around 13 kg/capita per year recently (Figure 5.). Among EU Member States significant consumers are Portugal (58 kg/capita), Spain (38 kg/capita) and Finland (35 kg/capita). The level of consumption has traditionally been high in these countries. In Italy fish consumption has doubled in the last decade and is now converging with the EU average.



Source: FAO Statistical Bulletin 2000

**Figure 5.** The annual consumption of fish and fishery products in the EU (average of 1997-1998)

Fish consumption levels in Central-Eastern European countries are much lower than in Western European countries. The Baltic States (Estonia, Latvia, Lithuania) are exceptions, where the level of consumption (and culture of consumption and processing) is close to the Western European level. (Figure 6.).



Source: FAO Statistical Bulletin 2000

**Figure 6.** The annual consumption of fish and fishery products in Eastern Europe

Aquaculture in the European Union is under pressure to comply with more and more stringent environmental protection measures, animal health, animal welfare and food safety laws and regulations. At the same time domestic fish products should meet the consumers' growing requirements and should also be competitive with non-fish and imported fish products. The Central-Eastern European accession countries have significant constraints in this area. These countries are in a difficult position after the political and economic changes in the early 1990s, due to significant changes in ownership, institutional systems and legal frameworks.

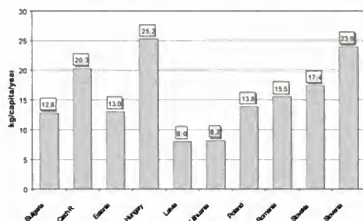
Major tendencies and features of fish consumption and production are summarised as follows:

- The knowledge of fish species and products of an ordinary customer is low, although, there are huge differences between countries and regions. (The quality of flesh, taste, bone content, utilisation etc. differs significantly, causing price differentiation. If consumers do not know the species, they cannot differentiate between value and other features, for which there is no possibility of enforcing differences between prices. For this, the consumers' knowledge of fish species is very important.);
- Most consumers are afraid of bones and repelled by the fishy smell and mucus;
- Consumers living in the countryside in Central-Eastern Europe are mainly looking for live fish to prepare traditional meals, while consumers in cities have a demand for processed products;
- In Central-Eastern European countries there is a growing share of Western European imported marine fish and other seafood in the market;
- There is a long term tendency in Western and Central-Eastern Europe, that the relative popularity of common carp decreases;
- As income of consumers increases – especially in cities - demand for processed fish products also increases;
- Demand for fish “fresh on ice” is also increasing in Central-Eastern European countries, at the expense of live fish;
- Customers have a growing demand for quality and attractive packaging;
- Demand for organic fish products is expressed and increasing;
- The role of food security is becoming more important;
- In Central-Eastern European countries, Austria and Germany, fish consumption shows a seasonal pattern (there is high demand especially at Christmas time), but seasonality decreases with continuous fish supply through hypermarkets;
- The role of hyper- and supermarkets grows, while fishmongers and marketplaces have a decreasing share of the market especially in Central-Eastern European countries;
- Among processed products, the demand for frozen and canned products decreased, at the same time the demand for kitchen-ready fresh fish increases;
- Special fish departments are being created in hyper- and supermarkets to meet the demand of modern consumers living in cities;
- There is a significantly higher marketing communication;
- The influence of multinational firms in fish trade is growing;
- The customers require the expansion of product ranges.

### Competition among aquaculture products, fish and non-fish meat products

There is inevitably generalised competition between capture and farmed supplies in consumption, but the extent to which farmed and capture supplies are regarded as direct substitutes varies from one species to another. Given the rather blurred distinction between aquaculture and capture products, much of the discussion of demand and market applies equally to products from both sources. With the exception of salmon, demand and market for farmed fish *per se* have been little investigated, mainly due to the lack of sufficiently specific data which distinguish between farmed and wild caught fish (MacAlister Elliott and Partners, 1999). However, the species cultured in freshwater farms in Europe are mostly not available as wild caught fish in most markets. While import realities (such as trade of salmon and shrimps) would not be expected to change significantly in the future, the availability of a large internal market and the scope for species/product substitution (fisheries or imports) will be the main stimuli for aquaculture development in Europe (Varadi *et al.*, 2000). While the volume of international trade of several wild caught species has been declining since the late 1980s, the international trade of products such as shrimp and salmon, for which a substantial aquaculture sector has developed, has increased since 1980. It is highly likely that the role of aquaculture in the world fish supply will increase substantially and will be a dominant source for several internationally traded species. Most western economists know little about the seafood trade, especially in Asia and Eastern Europe, where aquaculture has traditionally been a significant factor. For both private and public decision-making, much economic research on trade and aquaculture must be undertaken. The surface has only been scratched (Anderson and Fong, 1997).

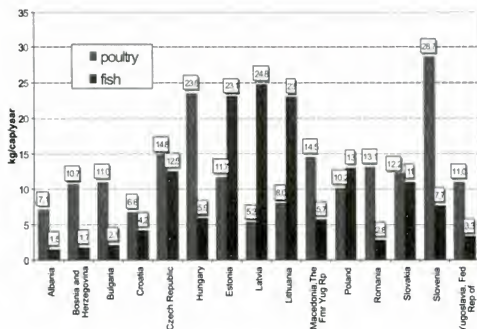
One of the greatest challenges in fish marketing is how to compete successfully with meat products, which are supplied through international channels to the food market. There is no doubt that trends towards healthy eating (non-red-meat-eating) and greater consumption of convenience food and processed fish have improved the market position of fish. Fish and poultry as white meats are obvious competitors on the food market. Poultry has a significant role in meat consumption in Central-Eastern European countries (Figure 7), where the yearly consumption *per capita* is the highest in Hungary and Slovenia (24-25 kg *per capita*).



Source: FAO Statistical Bulletin 2000

**Figure 7.** The annual poultry consumption in Central-Eastern Europe

The poultry and fish consumption in Central-Eastern European countries is shown in Figure 8. The data indicate the scope for increasing fish consumption through aquaculture development in many countries. In the most developed countries in this region (e.g., Czech Republic, Poland and Slovenia) fish consumption levels are close to that of poultry, while well below poultry consumption in some countries, where otherwise good conditions are available for aquaculture.



Source: FAO Statistical Bulletin 2000

**Figure 8.** Poultry and fish consumption in Eastern European countries

Competition with a well organized and progressive poultry industry throughout Europe is a great challenge for the aquaculture industry, which is geographically dispersed and includes hundreds of small-size farms. There has been a remarkable development in production and consumption of poultry all over the world. World poultry production and consumption will set new records during the year 2001, helped by consumers doubts about red meat in the wake of near hysteria about BSE and foot and mouth disease. Production and consumption of poultry meat in the EU is also higher in 2001 because of increased demand spurred by the BSE effects. A decline of 1 percent from 2000 in poultry exports is projected for the EU because of an increase in domestic consumption, as consumers respond to the BSE crisis (STATpub.com, 2001). The massive growth of chicken and turkey consumption in the United States indicates the possible trends for other regions of the world. Between 1976 and 1999, the *per capita* consumption of fish increased by a modest 12 percent, pork by 41 percent, while beef decreased by 33 percent and lamb decreased by 41 percent (Graves, USDA, 1999). Broiler chicken and turkey meat were the star performers with increases of 93 percent and 100 percent respectively over the same period (Swick and Cremer, 2001). Aquaculture has many attributes that give it the potential to become a major source of protein in the human diet in the future much like broilers are today. Feed conversion ratios are more favourable than broilers and many species are especially well suited for the production of a wide variety of attractive value added food products. However, similarly to the broiler industry, there is a need for the consolidation of the value chain by vertically integrated companies to a point, where single businesses control feed supply, growout, seed stock, processing and marketing of branded finished products (Swick and Cremer, 2001). Some special attributes of freshwater fish culture, such as the possibility of supplying fresh fish in a certain location and the natural way of production in ponds, could also be capitalized upon during the increasing competition with other meats produced in industrial systems.

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The Ad Hoc EIFAC/EC Working Party on Market Perspectives for European Freshwater Aquaculture met to address the current situation of the freshwater aquaculture sector in the EIFAC region, with particular focus on problems in marketing. The outcome of the workshop is to provide key information and strategic advice on how to fulfill the production potential of the sector to: (i) policy-makers, administrators and legislators; (ii) future investors; (iii) consumers; and, particularly, (iv) producers. Trout and carp (about 94 percent) dominate European aquaculture, whereas there are other promising candidates for culture that have not been profitably exploited. The freshwater aquaculture industry in Europe is product- or producer-driven along traditional lines and suffers particularly from a lack of vertical integration, linking producers to consumers through the marketing chain. The producers will remain at a disadvantage unless they develop better links through association or cooperation. While the preparation and implementation of marketing plans are responsibilities of the industry, and must be financed from this source, additional progress and great benefit could be derived from a comprehensive policy framework. Aquaculture as a food-producing system in some cases has been perceived as being in conflict with other parts of the ecosystem. This can best be addressed by the development and dissemination of codes of good aquaculture practice. While the demand for organically produced aquaculture products is growing, certification is still largely based on the standards of private certification bodies.

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